United States Court of Appeals
for the
District of Columbia Circuit

TRANSCRIPT OF RECORD

APPELLANTS' BRIEF

In The

United States Court of Appeals

District of Columbia

No. 8834

602

COURT OF APPEALS FOR THE
DISTRICT OF COLUMBIA

FILED OCT 19 1944

Joseph W. Stewart

CLERK

The Bullard Company, Edward P. Bullard, III,
Gustaf R. Appelberg, et al.,
Appellants,

v.

Conway P. Coe, Commissioner of Patents,
Appellee,

Appeal from the District Court of the United States for the District of Columbia

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IN THE

United States Court of Appeals

DISTRICT OF COLUMBIA

No. 8834

THE BULLARD COMPANY, EDWARD P. BULLARD, III,
GUSTAF R. APPELBERG, and ERNEST H. JOHNSON,
Appellants,

v.

CONWAY P. COE, Commissioner of Patents,
Appellee,

BRIEF FOR APPELLANTS

JURISDICTIONAL STATEMENT

This is an appeal from a final decree (Appen., p. 8) of the United States District Court for the District of Columbia (Bailey, J.) dismissing appellants' bill of complaint (Appen., p. 2) brought under Section 4915, R.S. (35 USCA Paragraph 63). The jurisdiction of this court is based upon the Act of February 9, 1893, C. 74, 27 Stat. 434, as amended, and as incorporated in the Code of the District of Columbia (1940 Ed. Title 17, Chap. 1, Sec. 101).

STATEMENT OF THE CASE

The Bill of Complaint alleges patentability of Claims 1, 2 and 21 of United States Patent Application Serial Number 302,834, filed November 4, 1939, in the names of Edward P. Bullard, III, et al. (Appen., p. 29). The only prior art now asserted against the application is patent No. 1,797,705, granted to Ernest J. Svenson on March 24, 1931, (Appen., p. 65).

STATUTES INVOLVED

The pertinent parts of the statute giving jurisdiction are as follows (Rev. Stat. § 4915, 35 U. S. C. § 63 [as amended Aug. 5, 1939, c. 451, § 4, 53 Stat. 1212]):

> "Whenever a patent on application is refused by the Board of Appeals * * *, the applicant, unless appeal has been taken to the United States Court of Customs and Patent Appeals, and such appeal is pending or has been decided, in which case no action may be brought under this section, may have remedy by bill in equity, if filed within six months after such refusal or decision; and the court having cognizance thereof, on notice to adverse parties and other due proceedings had, may adjudge that such applicant is entitled, according to law, to receive a patent for his invention, as specified in his claim or for any part thereof, as the facts in the case may appear. And such adjudication, if it be in favor of the right of the applicant, shall authorize the commissioner to issue such patent on the applicant filing in the Patent Office a copy of the adjudication and otherwise complying with the requirements of law."

The pertinent parts of the statute having to do with patentability are as follows (Rev. Stat. § 4886, 35 U. S. C. § 31 [as amended May 23, 1930, 46 Stat. L. 376]):

> "Any person who has invented or discovered any new and useful art, machine, manufacture, or composition of matter, or any new and useful improvements thereof,

> * * * not known or used by others in this country, before his invention or discovery thereof, and not patented or described in any printed publication in this or any foreign country, before his invention or discovery thereof or more than two years prior to his application, and not in public use or on sale in this country for more than two years prior to his application, unless the same is proved to have been abandoned, may, upon payment of the fees required by law, and other due proceeding had, obtain a patent therefor."

STATEMENT OF POINTS

The court below erred:

1. In holding, contrary to the evidence, that the Svenson patent, shown without contradiction to be inoperative, could be made operable by slight changes by a competent mechanic.
2. In holding that the evidence presented by appellants that the Svenson apparatus could not be made operative by slight changes well within the skill of a competent mechanic was not sufficient.
3. In not holding that Claims 1, 2 and 21 of application Serial Number 302,834, filed November 4, 1939, define a patentable invention.

SUMMARY OF ARGUMENT

A sole prior art apparatus is urged against appellants' invention. Although the claims in issue would literally read upon this apparatus if it were operable, the uncontradicted testimony is that it is incapable of operation. A model (appellants' Exhibit E), produced and operated in court graphically demonstrates the inoperativeness of the prior art apparatus, and the court's decision recognizes this. Appellants' expert witness, after careful analysis of the prior art apparatus, testified without contradiction that he could think or conceive of no changes in the inoperative apparatus to render it operable. The Patent Office introduced no evidence on this issue and its cross examination of appellants' expert served only to emphasize the testimony outlined above.

Despite this, and in the face of a total absence of supporting evidence, the court below held that it was "by no means satisfied that a competent mechanic could not, by slight changes, make this particular exhibit (appellants' Exhibit E) operative and still remain within the terms of the Svenson patent." This goes beyond the province of the court, and is reversible error.

ARGUMENT

Appellants' invention relates to machine tools, and particularly to the type which includes a tool that is moved into engagement with a rotating work piece to remove metal therefrom. The essence of the invention deals with a control comprising a member that is adapted to be moved in one direction for operating two clutches in a predetermined order to cause the work to start rotating before the tool starts moving toward it; and to be moved in an opposite direction for operating the same clutches in a different predetermined order to stop the movement of the tool before stopping the rotation of the work.

Svenson patent No. 1,797,705 is the sole prior art disclosure now urged by the Patent Office against appellants' invention. The claims in issue would read upon this prior art apparatus if it were operable. However, the prior art apparatus is not capable of operation.

The apparatus of this patent relates to machine tools of the same type disclosed by appellants. It deals with a control comprising a member that is adapted to be moved in one direction for causing three functions to be performed in the following order, namely, to start the work rotating; to start the tool moving toward the work; and upon completion of the machining operation, to stop the movement of the tool while the work continues to rotate. This member, although intended to be moved in an opposite direction for stopping the rotation of the work, actually cannot be moved in this reverse direction because of the inherent inoperative construction of the apparatus.

The uncontradicted testimony of the expert Baudis shows that it is absolutely impossible to move the member 78 in a reverse direction to stop the rotation of the work because "the outer edge of shoulder 91 on disc 80 interferes with the outer edge of lever 90 on disc 71 (locking) the mechanism" (Appen., p. 22, Q. 7). Nor can this interference be avoided, because the relation between the shoulder 91 and the outer edge of lever 90 is "inherent in the design"; is "critical to the structure"; and is necessary because "the operation of disc 71 to move clutch 36 to its active position by the forward movement of member 78 *can only occur* by the movement of the disc 80 such that its shoulder 91 moves disc 71 through an interlocking lever" 90 (Appen., p. 23, Qs. 1, 2). In other words, "the only reason this mechanism (Svenson's clutch 36) works (by moving member 78 in a forward direction) is because that provision for interference (witness pointing to shoulder 91 and the end of lever 90) is there, and if that interference were not there, * * * (Svenson's clutch 36) would not work (by movement of mmber 78) in the forward direction. So, if we remedied this mechanism so that we could bring it (member 78) back (to disengage clutch 29) it (member 78) would not work in the forward direction (to engage clutch 36)." (Appen., p. 26, Q. 4). This is graphically demonstrated by the model (appellants' Exhibit E), produced and operated in court.

The facts, standing unchallenged, establish the inoperativeness of the structure. And the appellants went beyond this and showed that it could not be made operative.

Mr. Baudis "carefully analyzed it (the Svenson patent) to determine its operativeness" (Appen., p. 20, Q. 5). He testified that he "searched every possible source and tried to make this mechanism work'' (Appen., p. 26, Q. 2), but could find no means, manual or otherwise, that would permit an operator to ''move this (member 78) back after it (member 78) is operated in a forward direction'' (Appen., p. 26, Q. 3).

Baudis further testified that during his study and analysis of the Svenson patent, he ''thought of all the possible changes in design which he (I) could and incorporated those changes which he (I) thought might work in there (the Svenson mechanism) and * * * came to the conclusion that it (the Svenson mechanism) could not (be made to) work'' (Appen., p. 27, Qs. 2, 4).

This testimony of the expert Baudis establishes beyond doubt the fact that after careful analysis he could think or conceive of no changes in the Svenson inoperative structure to render it operable. The Patent Office introduced no evidence on this issue, and its cross-examination of Baudis in no way qualified or limited the testimony outlined above.

The only attempt in the entire record, to show that appellants had not demonstrated inoperativeness of the Svenson structure is contained in an abortive mode of operation suggested by the Board of Appeals in the Patent Office in the following language:

> ''The disc 71 is under control of an operating handle 74 which may be operated to return this disc 71 to (a) position so that the arm 90 is free to swing back past the abutment (91) on the main control disc before it becomes locked according to appellants' interpretation of the operation.'' (Appen., p. 60.)

This mode of operation suggested by the Board of Appeals overlooks ''one really very important point (namely) when you move that (disc 71) manually (through handle 74 to return disc 71 to a position so that arm 90 is free to swing back past the abutment 91) * * * you immediately re-engage clutch 36 which sends this (member 78) forward again and brings you to the position where you started.''

(Appen., p. 24, Q. 1; see also p. 28, Q. 2.) Accordingly, by following the mode of operation suggested by the Board of Appeals in the Patent Office, clutch 36 is re-engaged before clutch 29 can be disengaged which instantly returns the apparatus to its locked condition.

Despite this, and in the face of a total absence of supporting evidence, the court below held: that it was "by no means satisfied that a competent mechanic could not, by slight changes, make this particular exhibit (appellants' Exhibit E) operative and still remain within the terms of the Svenson patent." This goes beyond the province of the court, and is reversible error.

In *Stone* v. *Stone,* 136 F. (2d) 761, this Court said (p. 764):

> "In this case there was positive testimony, uncontradicted, and not inherently improbable. Neither a jury nor a judge is at liberty to disregard such evidence * * * 'where the testimony is all one way, and is not immaterial, irrelevant, improbable, inconsistent, contradicted, or discredited, such testimony cannot be disregarded or ignored by judge or jury, and if one or the other makes a finding which is contrary to such evidence, or which is not supported by it, an error results, for which the verdict or decision, if reviewable, must be set aside. To hold otherwise would vest triers of the facts in cases subject to review with authority to disregard the rules of evidence which safeguard the liberty and estate of the citizen. 6 Pet. 622, 631, 8 L. Ed. 523.' George v. Capital Traction Co., 54 App. D. C. 144; 295 Fed. 965, 968; Walker v. Warner, 31 App. D. C. 76, 87."

See also: *Brown* v. *Petersen,* 25 App. D. C. 359, 363; *Department of Water and Power of City of Los Angeles* v. *Anderson* (C. C. A. 9th Cir.), 95 F. (2d) 577, 583; *Kohlsaat et al.* v. *Parkersburg and Marietta Sand Company* (C. C. A. 4th Cir.), 266 Fed. 283, 284; *Ex parte Westbrook* (P. O. Bd. App.), 48 U. S. PQ. 704, 705; *Smith* v. *United States* (D. C.

E. D. Ky.), 5 F. Supp. 475 (Syllabus); *Illinois Assurety Co. v. Standard Underground Cable Co.* (C. C. A. 3rd Cir.), 238 Fed. 546, 548.

A case, which in all respects is like the instant one, is *Manhattan Book Casing Company* v. *E. C. Fuller* (C. C., S. D., N. Y.), 274 Fed. 964 (aff'd, C. C. A., 2d Cir., 204 Fed. 286). There, the court by Judge Learned Hand, said (p. 967, 968):

> "It must therefore be conceded, and indeed it is not denied, except as I shall show later, that the machine as disclosed was an inoperable mechanism. However, the defendant must go further, and show that it could not be made operable by a skilled mechanic. *This it does by the testimony of its two experts, who say they do not see how it could be made to operate.*
>
> " * * * A judge is entirely unadapted to decide such a question as an original question, and must rely upon the testimony of skilled artisans or of experts in mechanics.
>
> "Here the only evidence is that a skilled artisan could not have done so. I cannot accept Gunz's testimony in rebuttal as raising an issue in this respect. The codefendants' witnesses at great length pointed out the difficulties, and showed that the machine as disclosed was thoroughly unworkable. It was not enough for Gunz to say merely that he disagreed with them in their subsequent conclusions that it could not be made workable. I agree that the burden of proof * * * is on the defendant; but the defendant had made out a case, *and the complainant had the burden of going forward with the proof to show how a skilled artisan could change it over.* I must conclude that he would not venture to show in detail how the difficulties could be remedied." (Italics ours.)

The analogy between that and the instant case is substantially perfect. Here, as there, appellants have shown "that the machine as disclosed (the Svenson) was an inoperable mechanism." Here, as there, appellants have recognized that they "must go further, and show that it (the machine) could not be made operable by a skilled mechanic." This appellants have done by the testimony of their expert, Baudis. Thus, here as there, "the defendant had made out a case, and the complainant (the Patent Office) had the burden of going forward with the proof to show how a skilled artisan could change it over." As the Patent Office has done nothing in this regard, it must be concluded "that he (the Patent Office) would not venture to show in detail how the difficulties could be remedied." And here, as there, "A judge is entirely unadapted to decide such a question as an original question, and must rely upon the testimony of skilled artisans or of experts in mechanics."

Here, however, the court below did assume the right "to decide such a question as an original question" and this unwarranted assumption is reversible error.

Every known authority which has refused to sustain proof of inoperativeness is based on positive evidence that the alleged inoperative device can be changed to make it operate. In the case at bar, no such evidence is contained anywhere in the record. And while many authorities could be cited in support of this contention, it is believed that *Remington Cash Register Company, Inc., et al.* v. *National Cash Register Company* (D. C., D., Conn.), 6 F. (2d) 585, will suffice to illustrate this general proposition. This decision is particularly pertinent because it emphasizes the close similarity between the facts of the case here and those of *Manhattan Book Casing Co.* v. *E. C. Fuller, supra.*

In the *Remington case,* inoperativeness was alleged and the evidence included conflicting testimony as to inoperativeness and testimony showing how the alleged inoperative device could be made to work. The party alleging inoperativeness cited *Manhattan Book Casing Company* v. *E. C. Fuller, supra,* in support of its allegation. In holding that inoperativeness had not been shown, Judge Thomas said (p. 631):

"Nor is there any conflict in the law propounded in the cases just cited with the claims of law made by the defendant upon this feature of the case, and as set forth in cases cited by defendant. For instance, reliance is placed upon Judge Hand's decision in Manhattan Book Casing Machine Co. v. E. C. Fuller Co. (C. C.), 274 F. 964. As pointed out by counsel for plaintiff at final argument, *the facts in that case were very different from the facts in this record. There the defendant presented proof that the machine of the patent was inoperative, and the plaintiff did not attempt in rebuttal to meet the proof thus adduced.* This appears quite clearly when the entire opinion is read. For instance, Judge Hand there said, at pages 966 and 967:

> " 'Now, it is here in evidence *with no contradiction at all,* as I shall show later, that the machine actually disclosed by the patent was inoperable. If the faults were merely in the diagrammatic representations, that would not be a defense, for diagrams or descriptions are not meant for working drawings. Crown Cork and Seal Co. v. Aluminum Stopper Co., 108 F. 845, 48 C. C. A. 72. But such drawings must at least show enough for the ordinary skilled mechanic to build the machine, correcting the discrepancies and the difficulties appearing in the drawings, by means of that store of expert information which such men will bring to the task in a bona fide effort to make the machine work. * * * It must therefore be conceded, and indeed it is not denied, except as I shall show later, that the machine as disclosed was an inoperable mechanism. However, the defendant must go further, and show that it could not be made operable by a skilled mechanic. This it does by the testimony of its two experts, who say that they do not see how it could be made to operate.'

"The court then goes on to say (p. 968) that it is not enough for plaintiff's witness (defendant's experts) 'to say merely that he disagreed with them in their subsequent conclusion that it could not be made workable. * * * I must conclude that he could not venture to show in detail how the difficulties could be remedied.'

> That that case was decided on the weight of the evidence adduced, or rather, on the lack of evidence offered by the plaintiff is also clear from the decision of the Circuit Court of Appeals, affirming Judge Hand, in 204 F. 286, 122 C. C. A. 440." (Italics ours.)

CONCLUSION

It is submitted that the decree of the District Court, dismissing the bill, should be reversed.

Respectfully submitted,

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COURT OF APPEALS
DISTRICT OF COLUMBIA

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BRIEF FOR APPELLEE

United States Court of Appeals

DISTRICT OF COLUMBIA

APPEAL NO. 8834

THE BULLARD COMPANY, EDWARD P. BULLARD, III,
GUSTAF R. APPELBERG, ET AL., APPELLANTS

v.

CONWAY P. COE, COMMISSIONER OF PATENTS, APPELLEE

APPEAL FROM THE JUDGMENT OF THE DISTRICT COURT OF THE UNITED STATES FOR THE DISTRICT OF COLUMBIA

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United States Court of Appeals
DISTRICT OF COLUMBIA

APPEAL NO. 8834

THE BULLARD COMPANY, EDWARD P. BULLARD, III,
GUSTAF R. APPELBERG, ET AL., APPELLANTS

v.

CONWAY P. COE, COMMISSIONER OF PATENTS, APPELLEE

APPEAL FROM THE JUDGMENT OF THE DISTRICT COURT OF THE UNITED STATES FOR THE DISTRICT OF COLUMBIA

BRIEF FOR THE COMMISSIONER OF PATENTS

INTRODUCTION

This is an appeal from the Judgment of the District Court of the United States for the District of Columbia (8)[1] dismissing the complaint (2) brought by appellants under the provisions of Section 4915, R. S. (U. S. C., title 35, sec. 63), in which it was sought to have the Court adjudge that the appellant, The Bullard Company, is entitled to have issued to it a patent on application Serial No. 302,834, filed November 4, 1939, of its assignor Edward P. Bullard,

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[1] The numbers in parentheses throughout this brief refer to pages of appellants' appendix.

III, et al., containing claims 1, 2, and 21 of said application.

STATEMENT OF THE CASE

The Bullard et al. application relates to machine tools and particularly to a metal turning lathe which includes means for rotating the work and another means for moving the tool toward and from the rotating work support, with mechanism for starting and stopping the movement of the tool and the work in accordance with a predetermined sequential order so that the tool feeding drive is stopped prior to the stopping of the work rotating drive, and the work rotating drive is started prior to the starting of the tool feeding drive.

Claim 1 of the claims in suit reads as follows:

> 1. A machine tool comprising in combination, means for supporting a work piece; power-operated means for rotating said work-supporting means; means for supporting a tool; power-operated means for moving said tool into engagement with the work on said work-supporting means; and unitary manually-operable means including a member adapted to be moved in two directions for starting and stopping both of said power-operated means in accordance with a predetermined sequential order.

The three claims were rejected in view of the patent to Svenson, No. 1,797,705, on which these claims literally read. Appellant contends that the apparatus disclosed in the Svenson patent is inoperative, since a certain member of the control mechanism which is designed to control the relative movements of the tool and the work cannot after its movement in one direction be moved in a reverse direction to stop the rotation of the work.

The District Court made the following finding of fact:

> 5. Plaintiff contends that the apparatus of the Svenson patent is inoperative but the evidence presented by the plaintiff is not sufficient to show that it could not be made operative by slight change well within the skill of a competent mechanic.

SUMMARY OF ARGUMENT

The inoperativeness of a patented machine is not established by merely showing that a machine constructed exactly as shown in the drawing of the patent is inoperative. It has not been established that correction of the alleged defect in the mechanism of Svenson was not well within the skill of the mechanic.

ARGUMENT

It is not deemed necessary to attempt to point out in detail the mechanisms of the application in suit and of the Svenson patent, since the question turns rather upon the character of the evidence presented at the trial.

A patent is presumed to be valid and that includes the presumption that the disclosed mechanism is operative for the purpose intended.

It is well settled, as shown by the decisions cited in Appellants' brief, *Manhattan Book Casing Co.* v. *E. C. Fuller,* 274 F. R. 964, and the same case on appeal, 204 F. R. 28, that the one who undertakes to establish that the patented device is inoperative "must show that it could not be made operable by a skilled mechanic."

The witness testifying on behalf of plaintiff in the present case stated that he had made a model in accordance with the disclosure of certain parts of the Svenson device and that the desired movement of a "member 78" could not be carried out due to the interference of two other parts of the machine which necessarily occurred due to the design of the machine (23).

Admittedly, however, no attempt was made to modify this device, the model which was put in evidence having been made "in accordance with the drawing" [of the patent].

Having his model made in accordance with the drawing he did not, he testifies, make any further model with changes in the structure in an attempt to so modify the structure as to avoid the difficulty because he could not conceive of any other means for making it work and "came to the conclusion that it just could not be made to work in that way." So we have no evidence of the possibility of making the device operative, even if it were not operative in its exact form, except the opinion of the witness given without experimentation.

The examiner had based his rejection of the claims in suit on the Svenson patent, and that action had been affirmed by the Board of Appeals. The presumption of the correctness of these holdings is strengthened by the finding of the District Court.

However there is an additional reason for holding that the judgment of the District Court should be affirmed. The claims, admittedly, read on the disclosure of the Svenson patent. If the device of the patent is not operable and the device of the application is operable, it must be, since both devices were designed for the same purpose, that the difference in operation is due to a difference in the two mechanisms. The claims, however, do not in any way bring out that difference.

As was said by the United States Court of Customs and Patent Appeals in *In re Crecelius,* 24 C. C. P. A. 718, 86 F. (2d) 399:

> It is elementary that claims must distinguish from the references even if they are inoperative.

See also the decision in *In re Perrine,* 27 C. C. P. A. 1127, 111 F. (2d) 177, in which the Court said:

> We agree with the Patent Office tribunals that allowable claims must distinguish over the structure of the reference regardless of the results obtained. A patent of this character is granted on account of an inventor's contribution in the form of structure and not solely upon results.

CONCLUSION

It is submitted that the Judgment of the District Court should be affirmed.

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R. F. Whitehead,
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November 1944.

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UNITED STATES
COURT OF APPEALS FOR THE
DISTRICT OF COLUMBIA

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No. 8834

JOINT APPENDIX TO BRIEFS

United States Court of Appeals

DISTRICT OF COLUMBIA.

THE BULLARD COMPANY, ET AL.,
Appellants,

vs.

CONWAY P. COE,
Commissioner of Patents,
Appellee.

**Appeal from the District Court of the United States
For the District of Columbia.**

WILSON PRINTING CO., WASHINGTON 1, D. C.—BRANCH P. EPES, MANAGER

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United States Court of Appeals
DISTRICT OF COLUMBIA.

No. 8834

THE BULLARD COMPANY, ET AL.,
Appellants,
vs.

CONWAY P. COE,
Commissioner of Patents,
Appellee.

JOINT APPENDIX TO BRIEFS

Appeal from the District Court of the United States For the District of Columbia.

1 Filed Aug. 12, 1943, Charles E. Stewart, Clerk.

IN THE DISTRICT COURT OF THE UNITED STATES FOR THE DISTRICT OF COLUMBIA.

THE BULLARD COMPANY, 286 Canfield Avenue,
Bridgeport, Connecticut,

EDWARD P. BULLARD, III, c/o The Bullard Company
Bridgeport, Connecticut,

GUSTAF R. APPELBERG, c/o The Bullard Company
Bridgeport, Connecticut, and

ERNEST H. JOHNSON, c/o The Bullard Company
Bridgeport, Connecticut

Plaintiffs,

versus

CONWAY P. COE, COMMISSIONER OF PATENTS
Patent Office
U. S. Department of Commerce Building
Washington, D. C.

Defendant.

Civil Action No. 20854.

Complaint For Issuance of Letters Patent Under Paragraph 4915 Revised Statutes.

1. This action arises under the Patent Laws of the United States, Revised Statutes Paragraph 4915 (35 USCA Paragraph 63), as hereinafter more fully appears.

2. The jurisdiction of this Court is based upon the fact that the defendant, Conway P. Coe is the Commissioner of Patents of the United States and has his official residence in the District of Columbia.

2 3. Prior to November 4, 1939, Edward P. Bullard, III, Gustaf R. Appelberg and Ernest H. Johnson were the original, first and joint inventors of a certain new and useful "Machine Tool" for which, on said date, they duly filed in the United States Patent Office an application, S.N. 302,834, for Letters Patent for said invention in full compliance with all requirements of law in such cases made and provided.

4. Plaintiff, The Bullard Company, is a corporation duly organized and existing under the laws of the State of Connecticut, having its principal place of business at Bridgeport, Connecticut, and said plaintiff is the assignee of the said Application S.N. 302,834 and of the right to have Letters Patent issued to it thereon.

5. The claims in the application which have been rejected by the Patent Office and upon which the present cause is based, are contained in the following language:

1. A machine tool comprising in combination, means for supporting a work piece; power-operated means for rotating said work-supporting means; means for supporting a tool; power-operated means for moving said tool into engagement with the work on said work-supporting means; and unitary manually-operable means including a member adapted to be moved in two directions for starting and stopping both of said power-operated means in accordance with a predetermined sequential order.

2. A machine tool comprising in combination, means for supporting a work piece; means for supporting a tool adapted to be moved into engagement with the work on said work-supporting means; power-operated means for imparting separate motions to the work-supporting means and the tool-supporting means; and unitary manually-operable means including a member adapted to be moved in two directions for starting and stopping both of said motions in accordance with a predetermined sequential order.

3 21. In a machine tool, means adapted to support work for movement; means adapted to support a tool for movement toward and from said work support; driving means for moving said work and tool supports; means for starting and stopping one of said supports including an arm; a member adapted to be moved in two directions; and a connection between said arm and member including a lost motion connection that is effective at the beginning of motion of said member in one direction and at the end of motion of said member in the other direction.

6. By a decision dated March 9, 1943, as amended by a decision dated April 1, 1943, the Commissioner of Patents, acting through the Board of Appeals of the Patent Office, finally rejected said Claims Nos. 1, 2 and 21 and refused and still refuses to issue a patent covering said claims.

7. No appeal has been taken from the said decision of the Board of Appeals to the United States Court of Customs

and Patent Appeals and all conditions precedent to this action have occurred or been performed by plaintiffs, and each of them.

8. The plaintiffs are willing and hereby offer to pay all expenses of this suit, as and when ascertained by this Honorable Court and any and all lawful fees and charges arising from or incidental to said application and the issuance of Letters Patent thereon.

Wherefore plaintiffs demand judgment that plaintiff, The Bullard Company, is entitled to a patent for the invention set forth in the aforesaid application of the plaintiffs,
Edward P. Bullard, III, Gustaf R. Appelberg and
4 Ernest H. Johnson, as claimed in Claims Nos. 1, 2
and 21 and including the subject matter of all the claims thereof, and authorizing the defendant to issue such patent to plaintiff, The Bullard Company, as assignee of said application and invention.

Paul M. Geist,
Attorney for Plaintiffs,
c/o The Bullard Company,
Bridgeport, Connecticut.

Of Counsel:
Robert C. Watson,
815 Fifteenth Street, N. W.,
Washington, 5, D. C.
Dated: August 11, 1943.

* * * * * * * * *

5 *Answer to the Complaint.*

To the Honorable the Justices of the District Court of the United States for the District of Columbia:

1, 2. Defendant admits the allegations of paragraphs 1 and 2.

3. He admits that the plaintiffs, Edward P. Bullard, III, Gustaf R. Appelberg and Ernest H. Johnson, claiming to be the original and first inventors of a new and useful "Machine Tool", filed on application for a patent therefor, which application was given Serial Number 302,834.

4. He admits that said application was assigned to the plaintiff, The Bullard Company.

5. He admits the allegations of paragraph 5.

6. He admits that he has refused, and still refuses, to issue a patent to plaintiff, The Bullard Company, containing claims 1, 2 and 21 as set out in paragraph 5.
6 He denies that said plaintiff is entitled to such a
patent since it is deemed that said claims 1, 2 and 21 are not patentable, in view of the following prior patents and for the reasons given in the statement of the examiner in answer to the appeal, and in the decisions of the Board of Appeals, rendered March 9, 1943, and April 1, 1943, copies of which will be furnished at the trial:

Svenson	1,797,705	Mar. 24, 1931
Pearson	1,710,002	Apr. 23, 1929
Ellenwood	2,170,982	Aug. 29, 1939

Profert of copies of these patents is hereby made.

7, 8. He admits the allegations of paragraphs 7 and 8.

W. W. Cochran,
Solicitor, United States Patent Office,
Washington, D. C.
Attorney for Defendant.

September 2, 1943.

I hereby certify that a copy of this Answer to the Complaint was mailed today, September 2, 1943, to Robert C.

Watson, 815 Fifteenth Street, N. W., Washington, D. C., attorney for plaintiffs.

W. W. Cochran,
Solicitor.

* * * * * * * * *

7 Civil Action No. 20854.

THE BULLARD COMPANY, et al., *Plaintiffs,*
v.
CONWAY P. COE, *Commissioner of Patents,*
Defendant.

I think that the plaintiffs' claims clearly read on the Svenson patent. The plaintiffs argue, however, that the Svenson device is inoperative and to prove this they have introduced a model which they assert is made in accordance with certain parts of the Svenson patent. This model, as constructed, appears to be inoperative, but I am by no means satisfied that a competent mechanic could not, by slight changes, make this particular exhibit operative, and still remain within the terms of the Svenson patent.

The complaint should be dismissed with costs.

Jennings Bailey,
Justice.

May 11, 1944.

* * * * * * * * *

8 *Findings of Fact.*

1. This is an action in which it is sought to have the court adjudge that the plaintiff, The Bullard Company, is entitled to receive a patent on the joint application of its assignors, Edward P. Bullard, III, Gustaf R. Appelberg, and Ernest H. Johnson, Serial No. 302,834, filed November 4, 1939, containing claims 1, 2 and 21 of said application.

2. The Bullard et al. application relates to machine tools of the type that employ separate motions between the tool

and work during metal working operations and particularly to apparatus for starting and stopping the movements of the tool and the work in accordance with a predetermined sequential order so that the tool feeding drive is stopped prior to the stopping of the work rotating drive, and the work rotating drive is started prior to the starting of the tool feeding drive.

9 3. The patent to Svenson, No. 1,797,705, relates to machine tools of the same type as those disclosed in the Bullard et al. application and designed to be operated in the same manner.

4. Claims 1, 2 and 21 are generic in character and are readable on the apparatus of the aforesaid application and on that of the Svenson patent.

5. Plaintiff contends that the apparatus of the Svenson patent is inoperative but the evidence presented by the plaintiff is not sufficient to show that it could not be made operative by slight change well within the skill of a competent mechanic.

6. Claims 1, 2 and 21 of the Bullard et al. patent define no invention over the device disclosed in the Svenson patent.

Conclusions of Law.

1. Plaintiff is not entitled to receive a patent on the application of Edward P. Bullard, III, Gustaf R. Appelberg and Ernest H. Johnson, containing claims 1, 2 and 21 of said application, or any one of them.

2. The complaint should be dismissed with costs against the plainitffs.

JENNINGS BAILEY,
Justice.

• • • • • • • • •

10 *Judgment.*

This action came on to be heard at this term and thereupon upon consideration thereof, it is this 31st day of May, 1944,

ADJUDGED that the complaint be and it is hereby dismissed, with costs against the plaintiffs.

Jennings Bailey,
Justice.

* * * * * * * * *

12 *Agreed Upon Transcript of the Shorthand Report of the Proceedings Had February 10, 1944.*

* * * * * * * * *

13 Washington, D. C.,
Thursday, February 10, 1944.

The above-entitled cause came on for hearing at 11:30 o'clock in the forenoon, on Thursday, February 10, 1944, in the District Court of the United States for the District of Columbia, in the Court House, at Washington, D. C.

Before:

Honorable Jennings Bailey, Associate Justice of the District Court of the United States in and for the District of Columbia, there being

Present:

Paul M. Geist, Esquire, of Bridgeport, Connecticut, and Robert C. Watson, Esquire, of the firm of Messrs. Watson, Cole, Grindle & Watson, of Washington, D. C., in behalf of the plaintiffs; and

14 W. W. Cochran, Esquire, Solicitor, United States Patent Office, by Robert F. Whitehead, Esquire, in behalf of the defendant.

Thereupon the following proceedings and transactions were had and testimony was taken:

Mr. Geist: If your Honor please, I should like to enter my exhibits in evidence now, if I may.

The Court: Very well.

Mr. Geist: I would like to have marked as "Plaintiff's Exhibit A" this certified copy of the application. That is, a certified copy of application Serial No. 302,834, filed November 4, 1939, in the names of Edward P. Bullard, III, Gustaf R. Appelberg and Ernest H. Johnson.

(The document in question being a certified copy of application Serial No. 302,834, filed November 4, 1939, in the names of Edward P. Bullard, III, Gustaf R. Appelberg and Ernest H. Johnson, was thereupon received in evidence and was marked "Plaintiff's Exhibit A.")

Mr. Geist: I would now like to offer as "Plantiff's Exhibit B" the plate showing a portion of the mechanism of Figure 1 of the application.

(The plate in question showing a portion of the mechanism of Figure 1 of the application in issue was thereupon received in evidence and was marked "Plaintiff's Exhibit B.")

Mr. Geist: Next I would like to offer the plate showing Figures 3 and 6 of the application in issue as "Plaintiff's Exhibit C."

(The plate in question showing Figures 3 and 6 of the application in issue was thereupon received in evidence and was marked "Plaintiff's Exhibit C.")

15 Mr. Geist: As Plaintiff's Exhibit D, I introduce the copy of patent No. 1,797,705 to Svenson.

(The document in question being a copy of patent No. 1,797,705 to Svenson was thereupon received in evidence and was marked "Plaintiff's Exhibit D.")

Mr. Geist: And as "Plaintiff's Exhibit E" I would like to present the model showing the control mechanism of patent No. 1,797,705 to Svenson.

(The model in question showing the control mechanism of patent No. 1,797,705 was thereupon received in evidence and was marked "Plaintiff's Exhibit E.")

Mr. Geist: And, as "Plaintiff's Exhibit F," I will offer the piece of metal, partially turned.

(The piece of metal in question was thereupon received in evidence and was marked "Plaintiff's Exhibit F.")

Mr. Geist: I should like to call Mr. Louis J. Baudis as an expert witness.

Thereupon

LOUIS J. BAUDIS

was called as a witness for and in behalf of the plaintiffs herein, and being then and there duly sworn by the Clerk of the Court, assumed the witness stand and, upon examination, testified as follows:

Direct Examination.

By Mr. Geist:

Q. Will you state your name, age, address and occupation? A. My name is Louis J. Baudis; my age is thirty; and I reside at 56 Dunnlea Road, Fairfield, Connecticut. My occupation is mechanical engineer.

16 Q. By whom are you employed? A. I am employed by the Bullard Company, Bridgeport, Connecticut.

Q. What does The Bullard Company manufacture? A. The Bullard Company manufactures metal turning lathes and automatic turning lathes and, in addition, since the advent of the war, they have taken on contracts for the manufacture of eighteen-inch British aerial torpedoes, rubber mixing machines, and other heavy duty war equipment for the War Production Board.

Q. You spoke of eighteen-inch aerial torpedoes. Is that the longitudinal dimension? A. That is not the longitudinal dimension and refers to the diameter of the torpedo. It is eighteen inches in diameter.

Q. In what capacity are you employed by the Bullard Company? A. I am employed by The Bullard Company as mechanical engineer and as assistant to the vice president in charge of manufacturing.

Q. How long have you been employed in your present capacity? A. Two years.

Q. What are your duties in your present capacity? A. My duties are to assist in the supervision of all departments and to endeavor to get the maximum production out of all departments, whether they be direct production or indirect production, such as inspection, or the development of methods of manufacture.

Q. How long have you been employed by The Bullard Company? A. Nine years.

Q. Will you give a brief description of your duties from the time you were employed by The Bullard Company until you attained your present capacity? A. When I first
17 came to The Bullard Company I spent three years
in the plant and during that time I was required to operate every type of machine which The Bullard Company owned.

At the conclusion of that three-year period I was placed in a tool room where I completed my tool making experience and was accredited as tool maker.

Then I was transferred to the Standards Department wherein or whose function it is to decide on the best method of manufacture and the tooling required for the best manufacture in all parts of the Bullard machines.

While in the Standards Department the war came upon the United States and the defense effort started. It was then that a critical shortage of machine tools developed and The Bullard Company were requested to multiply its production by whatever means it could possibly and just as fast as it could do it.

It was therefore necessary to survey the market of new machine tools available and use the machine tools available so that we could swing into the production of our machines.

This survey resulted in the ultimate expenditure of approximately three and a half million dollars of Government funds, as given to us by the D. P. C. and E. P. F. These purchased approximately four hundred machine tools. I was instrumental in the purchase of those four hundred machine tools.

When that work was completed and the production had multiplied from the normal output of two hundred machines per year to 3,200 machines of the same type I was transferred to my present position; that is, assistant to the vice president in charge of manufacturing.

Q. What educational background have you? A.
18 I have a Bachelor of Science Degree in Mechanical Engineering from New York University, in 1936.

Q. You testified, did you not, that you operated all types of machines employed in the machine shop at the Bullard Company? A. That is correct. I operated all types of machine tools in The Bullard Company.

Q. You are familiar with these, or are you familiar with the structure disclosed in issue? A. Yes, I am.

Q. First, how many different types of machine tools are there in the machine shop of The Bullard Company? A. I would say we have approximately fifty types.

Q. Did you study or did you not study the patent application that relates to this structure that is here involved? A. Yes, I studied it.

Q. To what does the structure relate? A. The structure relates to an invention in a metal turning lathe which provides for a means of rotating the work and another means for moving the tool toward and from the rotating work support.

Q. What is the order of starting and stopping the rotation of the work support and the movement of the tool support? A. The order is this:

The work starts rotating before the tool starts toward the work.

When the work is up at its sufficient best cutting speed the

tool moves toward the work. This movement of the tool continued until the operating or the turning operation is complete. When the turning operation is complete the
motion of the tool stops but the work spindle continues
19 to rotate.

When the tool support has stopped completely and at the desired time, the work support stops its rotation.

Q. Have you read the Claims 1, 2 and 21 of the application in issue, and do you understand the meaning of those terms of those claims? A. Yes.

Q. What is the nature of the removal of metal in a turning operation medium described in the claims, and will you describe it from the model which has been received in evidence as "Plaintiff's Exhibit F"? A. Work rotates in this manner (indicating) and a tool is fed toward a piece in a downward direction.

As the work rotates and the tool continues to feed a continuous strip of metal is spirally removed, and this removal continues as long as the turning operation goes on.

Q. Should both the rotation of the work and movement of the tool during a turning operation simultaneously stop, what would be the result? A. Well, if the work stops rotating and the tool stops moving toward it, as the work rotation slows down the tool tip would remain buried in the work and the metal would continue to move and would be machined until the work stops rotating.

Q. Of what significance is this? A. It would have a very bad, very detrimental effect. All metals have a best cutting speed below which many adverse conditions may arise including tool chatter, as indicated here (indicating); it would
have the result of a tearing of the work as indicated
20 by the tool on this diameter being turned.

There would be a marking of the work, excessvie loads on the machine, breakage of the tool and other detrimental effects.

These adverse conditions will arise if the tool is fed into the work until the work stops rotating.

Q. With both the tool and work stopped and the tool buried in the work, what would happen if their respective motions were simultaneously started? A. The same disadvantages described in my last answer would be the result.

The same bad results would be effected.

Q. Does the structure of the application you just identified overcome these difficulties? A. Yes, it does.

Q. Now, referring to the drawing identified as "Plaintiff's Exhibit B" have you ever seen it before? A. Yes, I have.

Q. What does it show? A. It discloses only the essential portions of the invention which are necessary for a complete understanding of the claims which are being described here and discussed today.

Q. Have you ever seen the drawing identified as "Plaintiff's Exhibit C"? A. Yes.

Q. What is it? A. It is an enlargement of figures 3 and 6 of the application.

Q. Would you please explain to the Court how the disclosure of Exhibit B operates? A. The work sup-
21 port S is rotated by the following means:

It is rotated by a motor 26, through a clutch 29; a sleeve 55; gears 56, 57, 58; shaft 60; gears 65, 66; shaft 20 and gears 19, 18. The tool support T is moved down and up toward and from the support S by the action of a roll 82 attached to it and riding in a groove in a drum D. The drum D is rotated by a gear 67 on shaft 20; gear 68; shaft 69; clutch 70; gears 72, 73; shaft 75 and gear 78 in mesh with 79 on drum D.

Q. How is the clutch 29 operated? A. The clutch 29 is operated by the backward and forward motion of the arm 118 which is actuated through the shaft 119 as indicated here, and it moves the cam 120 causing the actuation of the clutch 29.

Q. How is the clutch 70 operated? A. The clutch 70 is operated by the actuation of this rod 145 which operates the valve 133 in a conventional hydraulic system, as indicated by this, and that moves the clutch back and forth in and out of engagement.

Q. In starting the machine, what is the order of operation of clutches 29 and 70? A. When the machine is started, the ring segment which is shown here, 115—

By the Court:

Q (interposing) Is that shown on Exhibit B? A. Yes. That would be this ring here, your Honor (indicating). It is a cross section there, and that would be looking down on top of it.

The Court: Yes, I understand.

22 The Witness: As the ring is moved in the direction of the green arrow there is no lost motion between the arm 118 and the ring.

This causes an immediate movement of the arm from its inactive position, from this position (indicating) to the position it assumes when moved in the direction of the green arrow. It immediately operates clutch 29, starts the rotation of the work S.

I would add that during this time cam 148 provides the lost motion link between it and the valve because it is then operating on this section of the cam (indicating), the same distance from the center. Therefore, it has no effect on the arm in moving it back and forth.

By Mr. Geist:

Q. Can you explain to the court how ring 115 operates arm 118, precisely? A. Referring to the Figure 6, arm 118 is provided with a lost-motion connection between it and the ring 115. This connection includes a pin 150 fixed to ring 115 that extends into a slot 151 in the end of the arm 118. Lost motion occurs only during a portion of the movement of ring 115 in each direction and during the remainder of movement of ring 115, it and arm 118 move together.

Q. Can you explain how ring 115 operates valve 133? A. Valve 133 is provided with an actuator rod 145 that has a roll 146 attached to its free end. Roll 146 follows a cam path 147 in a plate 148 fixed to ring 115. The form of the cam path provides lost motion between ring 115 and rod 145 during a portion only of the movement of ring 115
in each direction. During the remaining movement
23 of ring 115, cam 147 positively moves rod 145 to
operate valve 133.

Q. During this continued movement of ring 115 in the direction of the green arrow what happens to the arm 118? A. The arm 118 remains idle because at this point where this cam starts operating, the rod 145 is moved to operate valve 133 and move the clutch 70 from its inactive to its active position to thereby start up and down movement of the member T.

Going back to that lost motion, I will be glad to explain it to you if I can.

The Court: Yes, I wish you would.

The Witness: This pin, and this is perhaps a better section to look at it from, the roller 155 strikes this cam 157 which causes the movement of this pin into this spread out section of the arm as indicated here (indicating). That removes this member (indicating) from the path of this pin and enables the pin to move from this side to this side without affecting any movement.

By Mr. Geist:

Q. During operation—

The Court (interposing): Just a minute, please. In Exhibit B, where is the connection between the clutch movement in the green, and the clutch 29 or 24 in Figure B?

The Witness: I am very sorry.

By the Court:

Q. You said that when this ring is moved— A. (Interposing): In the direction of the green arrow?

Q. Yes. There is a certain lost motion in the mech-
24 anism? A. In the cam.

Q. But where is that shown on Figure Exhibit B where the ring, as I understand it, is down along about 117? A. That is right here, your Honor (indicating).

Mr. Geist: You look at it on the side.

The Court: I see that now. I thought that was valve 139 you referred to.

The Witness: Yes, I can see that.

This is merely an enlargement to show this section of the work right here (indicating).

The Court: I can understand that now. But I thought you stated that on Figure B—that was on the upper left hand corner—

The Witness (interposing): The valve is here, a conventional hydraulic system that leads into this mechanism here (indicating).

The Court: I understand now.

By Mr. Geist:

Q. With the ring 115 in the direction of the green arrow as far it moves, what would be the condition of the work support and tool support? A. The work support S would be rotating and the tool support T moving toward the work.

Q. Where would Arm 118 and operator member 145 be located in that position? A. You mean when this is moving and that is moving?

Q. That is right. A. Well, the arm would be in this position, and active position, with the arm 118 off to the
25 left, like this (indicating).

Q. In other words, while the machine is operating the parts are as shown in Figure 3 as the active position. Will you explain what happens upon initial movement of the ring 115 in the direction of the red arrow? A. As the ring is moved in the direction of the red arrow immediate action takes place on the arm 145 because the roller is acting on the active part of the cam; therefore, the rod is withdrawn thereby operating the valve 133 which operates this hydraulic system up top here, and that withdraws clutch 70 from active to inactive position and the tool support stops moving.

Q. What happens during the initial movement of the ring 115 in the direction of the red arrow with respect to arm 118? A. The pin moves from this position to that position relative to this arm and the lost motion between ring 115 and the arm 118 occurs so that clutch 29 remains active and the work support S continues to rotate.

Q. During continued movement of the ring 115 in the direction of the red arrow, what happens to the arm
14 118? A. During the continued movement of ring
115 in the direction of the red arrow, the lost motion having already been consumed, the pin strikes against the arm 118 thereby causing the ring 115 and the arm 118 to move together.

This will cause disengagement of the clutch 29 and stop the rotation of the work support S.

Q. Will anything happen to the valve 133 during the last movement of the ring 115? A. No. Nothing can happen to the valve because, once more, the roller is on the section of the cam which provides for lost motion. Therefore, the valve stays in its original position.

Q. Therefore, when the ring 115 is moved as far as it can be in the direction of the red arrow what is the position of the support S and the member T? A. The support S has stopped its rotation and the member T has stopped its movement. In other words, it is in its inoperative position.

Q. Have you had occasion ever to see machines embodying the structure claimed in claims 1, 2 and 21 and as disclosed in plaintiffs' Exhibits A, B and C? A. Yes. I have.

I have seen such machines. I have seen them at The Bullard Company from the summer of 1939 to date.

Q. Did you operate any of those machines? A. Yes, I did.

Q. Was their operation successful? A. Yes.

Q. Claim No. 1 of Plaintiffs' Exhibit A calls for "means for supporting a work piece."

27 Can you identify this means in plaintiffs Exhibit B? A. Yes. That means is the work support S.

Q. This claim also calls for "power-operated means for rotating said work-supporting means."

Can you identify this means? A. That means the green and yellow mechanism and the solid yellow mechanism; in other words it includes motor 26; shaft 28; clutch 29; sleeve 55; gears 56, 57, 58; shaft 60; gears 65, 66; and yellow-colored elements including shaft 20; and gears 19 and 18.

Q. Additionally, claim No. 1 calls for "means for supporting a tool".

Can you show the Court this means? A. That means on this sketch, is the support T, colored green on Exhibit B.

Q. The claim also calls for "power-operated means for moving said tool into engagement with the work on said work-supporting means."

Can you identify this power-operated means? A. It is the yellow and green-colored mechanism including motor 26; shaft 28; clutch 29; sleeve 55; gears 56, 57, 58; shaft 60; gears 65, 66; shaft 20; and green-colored elements including gear 67 gear 68; shaft 69; clutch 70; gears 72, 73; shaft 75; gear 78; gear 79; drum D; roll 82 and rod 83.

Q. Finally, claim 1 calls for "unitary manually-operable means including a member adapted to be moved in two directions for starting and stopping both of said power-operated means in accordance with a predetermined sequential order." Will you identify this means and particularly the member that is movable in two directions? A.
28 The means referred to is this yellow arm mechanism

and the green-colored valve mechanism and the ring 115 is the member you refer to as being movable in two directions.

Q. Claim 21 calls for "means for starting and stopping one of said supports including an arm."

Can you identify this arm? A. The arm is either 145 in the green mechanism or the arm 118.

Q. It also recites "a member adapted to be moved in two directions".

What is that member? A. That member is the ring, 115.

Q. Finally, this claim calls for "a connection between said arm and member including a lost motion connection that is effective at the beginning of motion of said member in one direction and at the end of motion of said member in the other direction.

What is this connection? A. That connection would be either the roller 146 or the pin 150.

Q. I show you a copy of patent number 1,797,705 in the name of Svenson and ask you if you have ever seen it before? A. Yes, I have seen it.

Q. Did you make a study of this patent? A. Yes. I carefully analyzed it to determine its operativeness.

Q. To what does the patent relate? A. It relates to a
metal turning lathe having a provision for a work
29 support which rotates, and a tool support which
moves back toward and away from the work support.

Q. Does it disclose any mechanism for controlling the starting and stopping of the rotation movement of the work and the tool supports? A. Yes, it does disclose such a mechanism.

Q. Has a model of this control mechanism been made? A. Yes. That is Exhibit E at my right.

Q. Does this model show all the parts of this control mechanism as disclosed in patent 1,797,705? A. It shows all the parts there disclosed in this patent.

Q. Referring to the model, what causes the work to rotate and the tool to move? A. The work starts its rotation through a motivation of G, by the engagement of, clutch 29 that is the movement from the inactive position to the active position.

Q. And what starts and stops the operation of the tool support? A. The operation of clutch 36 starts and stops the movement of the tool support.

Q. How is clutch 29 moved? A. Clutch 29 is moved into engagement and out of engagement by the movement of the disc 80 in the direction of the green arrow, to engage it, and in the direction of the red arrow to disengage it.

Q. How is clutch 36 moved? A. Clutch 36 is moved through a movement of the disc 71 in the direction of the green arrow which starts the movement of the tool and in the direction of the red arrow to stop the movement of the tool.

Q. Is the operation of the disc 71 dependent upon the operation of disc 80 when both are under the influence of the control mechanism? A. When under the influence of the control mechanism the movement of the disc 71 is entirely dependent on the movement of the disc 80.

The interdependence is shown by the abutment 91 and the lost motion link 90.

This abutment 91 strikes the lost motion connection 90 which moves the disc 71 in the direction of the green arrow.

Q. Where is that shown in the patent drawing? A. That mechanism would be shown in Figure 6, and the disc, of course, is listed as 80, a disc which moves the work clutch listed as 71 and the lost motion link is 90, and the clutches are connected to the links in the way described.

Q. With the machine in its normal inactive condition, will you explain what the operator does so that discs 80 and 71 are operated? A. Yes. The operator, using a manual means, moves the tool support toward the work support and at the same time as the member 78 is connected to the tool support it also moves in the same way.

In the operation of this particular case it is to the left, which we show; really he is moving forwardly. The operator, therefore, moves the mechanism forwardly until the star wheel 84 strikes the boss 81 on the disc 80. This will cause the engagement of the clutch 29 because it moves the disc in the direction of the green arrow.

31 Q. Why does the clutch 36 not become engaged at the same time? A. The lost motion link 90 provided here has its lost motion effective at this time. Therefore, although the link is moved, since there is lost motion, there is no effect on the clutch 36.

Q. What does the operator do then? A. In order to engage a power feed the operator continues the manual movement of member 78 forwardly which continues the movement of disc 80 in the direction of the green arrow, moving disc 71 in the direction of its green arrow to move clutch 36 from its inactive position to its active position without disturbing the active position of clutch 29.

Q. How does disc 80 move disc 71? A. No lost motion occurs between disc 80 and 71 during this continued forward movement of member 78 and, therefore, disc 71 is positively moved.

Q. What occurs when clutch 36 is moved to its active position? A. The tool support and member 78 move forwardly under power until lug 95 on member 78 hits boss 96 on disc 71 to move it in the direction of its red arrow to move clutch 36 from its active to its inactive position thereby stopping the forward movement of the tool support and member 78.

Q. How does Svenson contemplate moving clutch 29 from its active to its inactive position? A. By manually reversing the movement of member 78 so that the star wheel 85 engages boss 82 on disc 80 to move it in the direction of its red arrow.

32 Q. Can this be done? A. No.

Q. Why? A. The outer edge of shoulder 91 on disc 80 interferes with the outer edge of lever 90 on disc 71 and locks the mechanism.

Q. Can this interference be avoided? A. No. It cannot be avoided because it is inherent in the design.

These interfering parts are critical to the design. Their relative position which causes the interference is necessary to accomplish the desired results in moving the member 78 forward.

Q. How does the result you have just described or how does the condition you have just described come about? A. The operation of disc 71 to move clutch 36 to its active position by the forward movement of member 78 can only occur by the movement of disc 80 such that its shoulder 91 moves disc 71 through an interlocking lever.

Q. How does the structure of the application avoid this pitfall? A. That provides a means for independently moving the tool and work clutches by providing a connection between the valve 133 and ring 115 that is separate and independent of the operation of the connection between ring 115 and arm 118.

Q. Will you point out the two independent connections you refer to? A. The two independent connections I refer to are the cam and this member here (indicating) and the hydraulic mechanism which operates the tool clutch
33 and this mechanism here for operating the power spindle.

Q. You say that the reason the application structure will work and the model won't work is because the application connections are separate and distinct of each other and the same in the model are interdependent on each other. A. Not only are they interdependent on each other but they are interdependent on each other in such a way that it cannot work.

Q. Is it at all possible to return the structure of the model to its initial position say with the power supplied to the machine? A. If the power is supplied to the machine you cannot move this mechanism back to its normal position, and I will explain why.

Q. You say you cannot?

Why can't you take hold of this manual lever 74 and move it back in the same direction through the means of the disc 71 so that the abutment 91 may pass it? A. Well, you forget one really very important point: When you move that manual in the direction of the green arrow you immediately reengage clutch 36 which sends this forward again and brings you to the position where you started.

Q. Is there no way you can restore that model to the original condition? A. You can restore it to its original condition, yes, by the fact that by reengaging clutch 36 nothing happens on the model; you cannot move it into the engaged position mechanically, but you can reach in with
your finger and depress the link and manually dis-
34 engage the disc 80 and move that back, and then,
also, take the manual operation of moving the disc
71 to its model position, and then with one more manual operation that is taking this member and bringing it back to its normal position.

However, if we were making a machine it would be impossible to do that.

Q. Then I will ask you: Can the mechanism of the Svenson model be reset to its initial position under any circumstances? A. Only by a multitude of manual operations such as I have described independent of the rearward movement of the number 78.

Q. You previously testified, did you not, that you were instrumental in the purchase of more than 400 machine tools costing upward of 3½ million dollars involving many makes of automatic and semi-automatic lathes? A. Yes. That is right. We were particularly interested because the company realized the seriousness of the manpower shortage and we had to get machines that were automatic so far as we could, and automatic machines would, therefore, receive primary consideration over machines requiring an operator for full time.

Q. In your preliminary investigation, prior to the purchase of these machine tools, did you make any study of the commercially available automatic machine tools throughout this country, as well as other countries, from the standpoint of both new and used machinery? A. Yes, we did.

Q. Throughout all your experience, study and analysis, have you ever seen, or found any evidence that machines were ever manufactured, used or sold which embodied the control structure disclosed in Svenson patent as reproduced in the model which has been marked "Plaintiff's Exhibit E"? A. I have never seen such a machine using this mechanism.

Mr. Geist: That is all.

Cross Examination.

By Mr. Whitehead:

Q. Did you say you read this Svenson patent? A. Yes.

Q. He states how he made those relative movements that he describes there. When you went to make the model did you try to work out how the thing would work? A. Yes, sir.

Q. Or did you simply try to use the Patent Office drawing or machine drawing from which to make your model? A. Well, the model was made under the direction of the Patent draftsman and he made the model so that the relative complexity would be made more evident by using the model rather than the referring to the drawing.

Q. I understand that, but you made the model without any attempt to see if you could make it work? A. Oh, the model was made in accordance with the drawing. If it could be made to work it would be made to work, yes, sir.

Q. In making a model, are you not supposed to have some leeway instead of making a slavish copy of the draw-

36 ing? A. I suppose you could have some leeway, but there is no leeway possible which could make this mechanism work.

Q. Did you try to do it? A. Yes, oh, yes.

Q. Did you try to make it work or did you simply try to make a picture of the drawing here and then say "it doesn't work"? A. Before I agreed to come down here I searched every possible source and tried to make this mechanism work because it would be utterly foolhardy for me to say it would not work if someone were to come here and point out that it could work. It would be quite a reflection on my ability. Therefore, I did try to make it work and I know of no means whereby this will work in a forward direction.

Q. Well, when you tried to make this work, or did you try to make this work?

In other words the man in his patent states the order in which these things can be done. Did you notice that?

He says in his patent how it can be done but you say it cannot be done.

Did I understand you correctly?

A. That is exactly right. You cannot move this back after it is operated in a forward direction by manual means or any other that I know of.

Q. Does not that depend entirely on the way that lost motion member is put in there? A. As I endeavored to describe before, the only reason this mechanism works is because that provision for interference is there, and if that interference were not there it would not work in the forward direction at all.

37 So, if we remedied this mechanism so that we could bring it back it would not work in the forward direction.

Q. Then, as I understand you, you had somebody make this for you which, as I say, is nothing but a reproduction in wood of a drawing.

You set out to see if you could make it work. Is that right? A. Yes, sir.

Q. And you were not able to do that? A. No.

Q. Did you try to make any changes in the mechanism that you have there? A. Well, I thought of all the possible changes in design which I could and incorporated those changes which I thought might work in there and I came to the conclusion that it just could not work that way.

Q. You did not make other models than that and try it out, did you? A. It was evident to me—

The Court (interposing): Just answer the question. Did you make other models than that?

The Witness: No, sir.

By Mr. Whitehead:

Q. That is, you did not make a model of what you thought possibly could make it work? A. There was nothing which I thought possibly would work, using this mechanism.

As far as I am concerned, I could not find any means of making it work.

38 Obviously no model could be made of something that I did not feel could work.

Q. I understand that. But you did not make a model on the order of that, with some changes, to see if you could, by those changes, make it work? A. No model was made.

Q. Except the one that you have there? A. There is no complete model. The idea of using paper discs—we did that; but a model is expensive and elaborate, and this was made. Does that answer your question?

Q. That answers the question.

Well, as I understood you to say, you could not make that work according to the manner in which you constructed the model.

You could not throw that into position there (indicating)? A. You mean you could not make it move back through there?

Q. Yes. By doing that (indicating) you move those two little discs. A. Out of the interference?

Q. Yes. A. Mr. Whitehead, if I move this so that this member can slip back, you can see that as I move it that clutch 36 must become engaged as I move it to the right; the only way that that can get by is if you move it in that direction (indicating). Now, if that is done, clutch No. 36 is reengaged and the mechanism again moves forward under power and you are right back to where you had it before.

Mr. Whitehead: That is all.

Redirect Examination.

By Mr. Geist:

Q. In connection with these operations of the Sven-
39 son patent which Mr. Whitehead has asked you about,
concerning the operability of the Svenson structure,
you mentioned two or three times certain operations. Could you find those in the specifications, those operations that refer to the stopping of the work support by the disengaging of clutch 29? A. Yes. He has some information there on Page No. 2, Line 26, which starts:

"The control means is further operable, upon completion of the cutting operation to effect the disengagement of the feed clutch to stop the carriage and, at the start of the manually operated rapid return of the carriage, to disengage the main clutch to stop the spindle."

It says it does it but it does not say how.

Q. Is there any other operation of the Svenson patent that relates to the stopping of the work support and rotation? A. Oh, yes. Here it is at page 5, and it is line 33:

"The return movement of the tool supports under the manual control therefore moves the rear star wheel 85 into engagement with the depending pin 82 to effect a reverse rocking movement of the main clutch control disc 80 to disengage the main clutch and stop the spindle."

Q. Does it say anything about what happens to the shoulder 91 and the lever 90? A. Nothing.

Q. Is there any other portion of the specification that refers to the stopping of the rotation of the work? A. Yes. That is Page 5, Line 85:

> "The tool supports may then be returned to their remote positions by the manual control and in doing so the engagement of the star wheel 85 with the depending pin 82 swings the disc 80 to disengage the main clutch and stop the spindle."

Q. Is there anything else said there about the members 91 and 90? A. It merely says:

> "After the tool supports have been returned to their initial position, the finished work piece may be removed from the lathe and a new piece inserted."

But, since the machine can never be stopped, this is obviously impossible.

Mr. Geist: That is all.

(The witness thereupon was excused and retired from the witness stand.)

Mr. Geist: Shall I close now?

Mr. Whitehead: I would like to introduce this folder of the Patent Office as "Defendant's Exhibit No. 1.

(The folder in question was thereupon received in evidence and was marked "Defendant's Exhibit No. 1.")

* * * * * * * * *

Specification.

To All Whom It May Concern:

Be it known that we, Edward P. Bullard III, Gustaf R. Appelberg and Ernest H. Johnson, citizens of the United States and residents of Fairfield, Bridgeport and Bridgeport in the County of Fairfield and State of Connecticut have invented certain new and useful improvements in

Machine Tools of which the following is a full, clear and exact description:

49 This invention relates to machine tools of the type that employ separate motions between the tool and work during metal working operations, and particularly to apparatus for starting and stopping the movements of the tool and work in accordance with a predetermined sequential order.

Although the principles of the invention are applicable to any machine tool in which the starting and stopping of the tool and work movements are desired to be controlled, they will be described in connection with a multiple spindle lathe of the type disclosed in patents 1,360,175; 1,382,340; 1,455,282; and 1,845,478 granted to E. P. Bullard.

Metal working operations, especially those performed on lathes, remove metal spirally from the work. Simultaneous stopping of the rotating work and the rectilinearly moving tool leaves the tool point buried in the work to a depth depending upon the feed of the cutting tool. Subsequent starting of the lathe causes excessive forces for the transmission of the lathe to overcome; breaking of tool points; chattering of the tool with attendant marking of the work; as well as other harmful results incident to cutting work that is rotating at speeds lower than proper cutting speed.

An object of this invention is to provide apparatus adapted to be incorporated within a machine tool for sequentially controlling the starting and stopping of the respective drives for the work and the tool.

50 Other objects include, the provision of a lathe comprising apparatus for stopping the tool feeding drive prior to stopping the work rotating drive; the provision of a lathe comprising apparatus for starting the work-rotating drive prior to starting the tool feeding drive; the provision of a lathe comprising unitary apparatus for stopping the work-rotating drive prior to stopping the tool feeding drive and for starting the former prior to starting

the latter; and the provision of a lathe comprising fluid-operated means for controlling the starting and stopping of the tool feeding drive in predetermined order relative to, as well as in response to the manual starting and stopping of the work-rotating drive.

The above, other objects and novel features of the invention will become apparent from the following specification and the accompanying drawings, in which:

Figure 1 is a sectional elevational view of a multiple spindle lathe embodying the principles of the invention;

Fig. 2 is a plan view of the upper portion of the machine taken substantially along the line 2-2 of Fig. 1;

Fig. 3 is an enlarged plan view of a fragmentary portion of the apparatus disclosed in Fig. 2;

Fig. 4 is an elevational view of the apparatus shown in Fig 3;

Fig. 5 is a section taken substantially along the line 5-5 of Fig. 3;

Fig. 6 is a view similar to that shown in Fig. 3, with the control elements in different positions;

Fig. 7 is a diagrammatic section of a feature of the invention; and

51 Fig. 8 is a view similar to that of Fig. 7 with the parts in a different position.

Referring to Fig. 1, the principles of the invention are shown as applied to a multiple-spindle vertical type lathe having six spindles S, each supplied with a work-supporting table. The spindles are journaled in an annular-shaped carrier C surrounding a central column K. The carrier C is adapted to be indexed in a step by step motion about the column K by an indexing mechanism I, thereby successively to bring the work pieces on the tables into operating positions beneath a plurality of tool slides T driven by cam drums D located about the central column K. Each cam drum D is operated from a feed works F located in the upper part of the machine. There are five working stations, and one loading and unloading station. The five feed-works F are mounted within a housing supported on the upper portion of the column K. This housing additionally supports manually controlled, fluid-operated mechanism M adapted to start the rotation of the spindles S prior to starting the drive for the cam drums D, and for stopping the drive for the drums D prior to stopping the rotation of the spindles S.

Referring to Fig. 1, the lathe comprises a base 10, a central portion of which provides a support for the column K. The column K is characterized by a substantially hollow member 11 having a lower portion providing a bearing for the rotatable carrier C; an elongated hexagonal central portion provided with guide ways on its outside for tool slides 13 (only one being shown); a housing for the indexing mechanism I; and a top on which a base plate 15 is mounted for supporting the feed works F.

52 The carrier C comprises a substantially annular-shaped frame 12 in which a number of spindles 16 are journaled. In the machine illustrated, there are six spindles 16 each provided with a work table or chuck 17 on its upper end and a gear 18 on its lower portion by means of which the tables are driven when the carrier is stationed beneath a tool slide 13. The spindles 16 are operated by sliding gears 19 mounted on vertically disposed shafts 20 connected with, and driven by separate feed-works units F for each of said spindles. The five feed-works units F are also employed to impart movement to the tool slides 13 to feed tools 22, carried in tool holders 23, in a manner to operate upon work carried by the tables 17.

A standard 24 mounted on plate 15 is adapted to support a top plate 25 upon which may be secured power means, in the form of a motor 26, for driving the lathe. The under edge portion of the top plate 25 and the top edge portion of the feed-works base plate 15 are provided with annular grooves which align with each other for receiving the guiding plates 27 that serve to enclose the feed-works and other mechanism contained within the upper part of the machine.

The carrier C is adapted to be indexed about the column K by the indexing mechanism I driven by the motor 26. A shaft 28 extends downwardly from the motor 26 through the top plate 25 and through a main driving clutch 29 that is adapted to be manually and automatically operated to connect and disconnect the shaft 28 to the drive for the feed-works F. The lower end of the drive shaft 28 is provided with a pinion 30 which drives, through idler gears 31, a pinion 32 secured to a shaft 33. A pinion 34, secured
53 to the lower end of the shaft 33, drives a gear 35
upon a stub shaft 36 which is journaled in a bearing inside the column K. Upon the upper end of the shaft 36 is mounted a pinion 37 that meshes with a gear 38 loosely journaled upon a central indexing shaft 39. The upper portion of gear 38 includes a clutch face 40 including slots 41. A controller 42 is likewise journaled on the shaft 39 and is resiliently connected to an arm 43 keyed to shaft 39. The arm 43 supports a pin 44 that is adapted selectively to connect the gear 38 to shaft 39 upon cooperative action between the controller 42 and the tool slides 13, all as more fully described in patent 1,360,175.

Upon connecting shaft 39 to gear 38, the indexing mechanism I is adapted to be actuated. This indexing mechanism comprises an oscillatable index arm 45 journaled on a pin 46 at the outer end of a crank arm 47. The inner end of crank arm 47 is keyed to a shaft 48 that is driven by shaft 39 through gears 49 and 50. The one end of arm 45 is provided with a groove 51 adapted to engage the lower reduced portion 52 of the spindles 16. The opposite end of arm 45 is provided with a cross-head connection with a pivotal slide 53 coaxial with shaft 39 and which is adapted to cooperate with slide bearings 54 in the arm 45. The specific construction of the indexing mechanism I is substantially the same as that disclosed in patent 1,360,175.

The spindles 16 as well as the tool slides 13 are adapted to be driven by the motor 26 through the feed-works F and the vertically-disposed shafts 20. Furthermore, the feed-works units F are adapted to operate the slides 13 at feeding speeds directly related to the speeds at which spindles 16 are rotated as well as to operate said slides 13 at relatively rapid traverse speeds.

54 The shaft 28, extending through the clutch 29, supports a sleeve 55 that is adapted to be connected to and disconnected from the shaft 28 by operating clutch 29. A spur gear 56 is keyed to sleeve 55 and meshes with a gear 57 freely journaled on the indexing drive shaft 39 at the center of column K. The gear 57 meshes with a gear 58 for each of the feed-works units F. Since all of the units F are identical, only one has been shown.

As previously stated the five units F are arranged in a circle about the gear 57 and each includes a gear 58 in meshing engagement therewith. The gear 58 is fixed to the lower end of a vertically-disposed shaft 60 by a nut 59. The vertical shaft 60 is provided with a spiral gear 61 that meshes with a similar spiral gear 62, secured to a sleeve of a clutch member 63. Upon the upper end of the vertical shaft 60 is mounted a change gear 65 adapted to drive a second change gear 66 mounted upon the upper end of vertical shaft 20. Near the upper end of the shaft 20 is also mounted a worm 67 that meshes with and drives a worm gear 68 mounted upon a horizontal shaft 69 and having splined thereon a sliding clutch member 70 for a purpose to be described later. A clutch member 71, adapted to cooperate with clutch 70, is provided with an extension adapted to receive various change gears 72 positioned to mesh with corresponding change gears 73 on an extension of a clutch member 74. A shaft 75, journaled in the clutch member 63 at one end and journaled in the clutch member 74 at the other end, is provided with sliding clutch sleeves 76 and 77 positioned to engage the clutch members 74 and

63 respectively. The shaft 75 is splined to slidably receive the sleeves 76 and 77 and carries a worm 78 engaging a worm gear 79 secured to the cam drum D. The cam drum D comprises a substantially cylindrical member 80 secured to a vertical shaft 81. The drum 80 is provided with a groove that engages a roll 82 secured to a vertical shaft 83 that passes through the feed works base 15 and is attached to the tool slide 13 on the outside of column K.

The clutch sleeve 76 is provided with a groove to receive the forked end of a plunger lever 85 pivoted at 86. The plunger lever 85 is joined by a rod 87 to a forked lever 88 pivoted in like manner and engaging a groove in the sleeve 77. The arrangement is such that when the lever 85 is moved the lever 88 will be moved likewise. The plunger lever 85 is provided with a spring urged plunger terminating in an arrow-head 91, which tends, by engagement with a pin 92 on a rod 92′, to rock the plunger lever 85 to the extreme position in one direction or the other.

To provide for manually neutralizing the clutch sleeves 76 and 77, a handle 93 is suspended from the outer end of a lever 94 hinged on a stud 95 which is attached to the feed-works base 15. The inner end of the lever 94, being forked, engages an annular groove 96 in the lower end of a shaft 97 extending vertically through a clearance hole in the feed works base 15. The upper end of the shaft 97 engages one end of a neutralizing yoke 98 fulcrumed at 99. The yoke is provided with an irregular opening to receive a pin 101 secured to the plunger lever 85. The arrangements being such, that when the pin 101 is in the lower and narrower part of the opening, the clutch sleeves 76 and 77 are disengaged from the clutch members 74 and 63. When the yoke 98 is rocked to bring the pin 101 to the upper and larger part of the opening, the plunger 85 is free to move and allow the engagement of the clutch sleeves 76 and 77 with their respective clutch members 74 and 63. From the

foregoing it will be noted that the clutch member 63
56 is driven at a constant speed through the spiral gears
61 and 62, while the clutch 74 is driven at a changeable speed through the change gears 65, 66, 72 and 73. Therefore, by the engagement of the clutch sleeve 76 with the clutch member 74 or the clutch sleeve 77 with the clutch member 63 the shaft 75, worm 78, worm gear 79 and drum D may be driven at different speeds. Manual shifting of the shaft 92′ may be effected by turning handle 100 that is connected to the shaft 92′ by a crank arm.

Automatic shifting of the clutches 76 and 77 to effect movement of the slide 13 during a working operation and to neutralize said clutches at the top of the stroke of slide 13 is controlled by a disc (not shown) having adjustable dogs that are adapted to shift the rod 92′ in a manner substantially the same as the disc 193 shifts the rod 187 in patent 1,360,175.

An additional automatic control is provided for the clutches 76, 77 and the main clutch 29 during indexing of the carrier C. As the tool slide 13 ascends to its upper position after performing a working operation, a cam element 102 on the link 83 is adapted to engage a rod 103 that is connected to one end of a crank, the opposite end of which is fixed to an oscillatable shaft 104. A lug 105 is fixed to shaft 104 and is adapted to cooperate with one of a plurality of similar lugs 106 on the controller 42 to releasably hold said controller against rotation. Each slide T is provided with a separate such means and the respective lugs 105 are adapted to be moved to a position releasing controller 42 as the respective heads reach their upper limiting positions. Release of the controller 42 causes the plunger 44 to effect a connection between shaft 39 and gear 38 whereupon the index shaft 39 is rotated through a single revolution. During the single revolution of the shaft 39, the clutch 29 is adapted to be disconnected from the sleeve 55 to

effect stopping of the spindles 16; the gear 19 is lifted
57 out of mesh with the gear 18 by a cam (not shown); the crank 45 indexes carrier C to the next succeeding station; the gear 19 is dropped into mesh with gear 18; the clutch 29 is engaged to sleeve 55 to re-start the drive for the spindles 16; and finally, the clutch 77 is engaged to re-start the downward movement of the slide 13. All of the above listed functions are adapted to be effected sequentially in the order named during the single revolution of shaft 39. Accordingly, an additional controller 107 is keyed to the top of shaft 39. This controller is provided with cams 108, 109 adapted to disengage and engage clutch 29 with the sleeve 55 through the toggle joint 110. The controller 107 also includes a cam 111 adapted to cooperate with a link 112. The link 112 is fixed to a vertically-disposed shaft 113 that is connected to the rod 92′ by a crank 114.

Referring to Fig. 1, the controller 107 moves in a clockwise direction so that cam 108 initially disengages clutch 29 from sleeve 55. During substantially the first half of the revolution of controller 107 the indexing mechanism I lifts the gear 19 out of mesh with gear 18, indexes the carrier C, and drops gear 19 into mesh with gear 18. At this point in the revolution of controller 107, cam 109 effects engagement of clutch 29 with sleeve 55 to re-start the drive for spindles 16. Subsequently, cam 111 engages link 112 to engage clutch 77 with clutch 63 to begin a new working cycle.

The clutch 29 is adapted to be manually connected to, and disconnected from the sleeve 55 by oscillating a ring 115 that surrounds, and is journaled on the base-plate 15. The ring 115 is provided with depending handles 116 spaced at convenient points about the ring so that the machine may be started and stopped conveniently. Referring to Figs. 1 and 5, the ring 115 is provided with a depending rod 117 that is connected to one end of an arm 118, the opposite
58 end of which is fixed to a vertically-disposed shaft

119. The shaft 119 is provided with a cam member 120 adapted to shift a spool 121 splined to the sleeve 55. The spool 121 is also connected to the clutch 29 through a toggle joint 122. Slight oscillatable movement of ring 115 will engage and disengage shaft 28 with sleeve 55 through clutch 29.

During the setting up of a job on the lathe, frequent manual stopping and starting of the drives for rotating the spindles 16 and for operating the slides 13 is necessary so that the operator may inspect the manner in which the cutting is proceeding. Additionally, should the lathe inadvertently stop, due to power failure, while a cutting operation is proceeding, manual re-starting is required. Under these circumstances, the tool is buried in the work due to the fact that metal is spirally removed, and upon re-starting, the previously described difficulties such as tool chatter, tool breakage, work marking and undue straining of the lathe transmission are encountered. This invention provides means M between the manually-operable ring 115 and the feed-works F to insure stopping the dirve for the slides 13 prior to stopping the drive for the spindles 16, and for manually starting the latter prior to starting the former.

Referring to Figs. 1 and 2, each of the feed-works F is provided with a cylinder 123 in which a fluid-operated piston 124 is adapted to reciprocate. The piston 124 is provided with a piston rod 125 that is connected to an arm 126 which in turn engages clutch element 70. Fluid under pressure is alternately applied to opposite sides of the piston 124 through inlets 127, 128 that are connected to branch
59 conduits 129, 130 leading from main conduits 131, 132 common to all the feed-works F. The main conduits 131, 132 are alternately supplied with fluid under pressure through a valve 133.

Referring to Figs. 3, 7 and 8, the valve 133 is mounted on the top of the base-plate 15 and includes a piston 134 having two spaced annular grooves 135 and 136. The valve 133 is likewise provided with a fluid inlet 137 and an exhaust 138 in which a relief valve 139 is provided for maintaining a predetermined pressure within the valve 133 and for insuring that the system is completely filled with fluid. In the position of piston 134 as shown in Fig. 7, the conduit 131 is supplied with fluid under pressure from the inlet 137 and the fluid in conduit 132 is exhausted through the line 138. In Fig. 8, the piston 134 is in position to admit fluid under pressure to the conduit 132 from the inlet 137, and to exhaust the fluid in conduit 131 to line 138 through radially and axially disposed passages 140, 141 in the piston 134. The piston 134 is adapted to be axially moved by the oscillation of ring 115 to selectively admit fluid to opposite sides of piston 124 (Fig. 1). Accordingly, the plunger 134 is connected to a lever 142 attached to the upper end of a shaft 143 extending vertically through the feed-works base 15. The lower end of shaft 143, beneath the base 15, has attached thereto a lever 144 (Figs. 3 and 4) connected to an operating rod 145. A cam follower 146 is mounted on one end of rod 145 and is positioned to traverse a cam groove 147 in a cam 148 secured to the under side of the control ring 115. The rod 145 is guided for axial movement in a suitable bracket 149 secured to the feed-works base 15. The cam groove 147 is provided with an offset portion to provide the necessary radial movement of rod 145 to actuate valve 133, and an arcuate portion for a purpose to be described later.

The connection between the arm 118 and the ring 115 cooperates with the accurate and offset portions of cam groove 147 to effect the sequential operation of the clutch 29 and the valve 133 to start the spindles 16 rotating before starting the feeding of the slide 13, and to stop the latter prior to stopping the former. In order to obtain this sequential operation of valve 133 and clutch 29 by oscillating ring 115, a novel form of lost-motion connection is provided between the arm 118 and ring 115, the effectiveness of which occurs at the beginning of movement of ring 115 in one direction and at the end of movement of said ring in the opposite direction. The connection between ring 115 and arm 118 comprises a square portion 150 on the rod 117 fixed to ring 115. The portion 150 is located within a U-shaped opening 151 formed in the outer end of lever 118. The opening 151 is larger than the portion 150 to permit adequate relative movement between the ring 115 and the arm 118 so that the offset portion of cam groove 147 can actuate the valve 133 while maintaining the clutch 29 in fixed position.

The arm 118 is provided with an axial bore 152 adapted to receive a plunger 153 urged outwardly into opening 151 by a compression spring. The outward movement of plunger 153 is limited by the action of a pin 154 extending therethrough and through aligned elongated slots 156 in opposite sides of the arm 118. *The plunger 153 is adapted to be retracted from the opening 151 when the valve 133 is to be*
actuated, and to be inserted within the opening 151
61 *when the clutch 29 is to be actuated.* Accordingly,
the pin 154 is provided with a roller 155 adapted to cooperate with a cam 157 fixed to the under surface of the plate 15.

Referring to Fig. 3, the piston 134 is at its inner position thereby supplying fluid under pressure to the conduit 132 (Fig. 8) to effect engagement of clutch element 70 with element 71; and the arm 118 is in position to cause clutch 29 to be engaged with sleeve 55. Accordingly, Fig. 3 discloses the parts in position when a cutting operation is progressing. Initial counter-clockwise movement of ring 115 will be independent of the arm 118 until the portion 150 engages the opposite wall of opening 151. During this initial movement, the cam groove 147 moves in a counter-clockwise direction a corresponding amount, whereupon roller 146 is moved from the position shown in Fig. 3 to the position marked B. This movement of roller 146 withdraws piston 134 to its outer position and causes fluid under pressure to be admitted to conduit 131 to shift clutch element 70 out of engagement with element 71 thereby stopping the feed of slide 13.

Continued counter-clockwise movement of the ring 115 causes the arm 118 to be moved therewith to effect disengagement of clutch 29 from sleeve 55 to stop the spindles 16. During this movement the arcuate portion of cam groove 147 maintains the valve 133 in position to insure separation of clutch elements 70 and 71. Counter-clockwise movement of arm 118 withdraws roller 155 from engagement with cam 157 thereby permitting plunger 153 to enter opening 151 and to assume the position shown in Fig.
62 6,—locking portion 150 to the arm 118.

When it is desired to re-start the lathe, the parts are in the positions disclosed in Fig. 6. Initial clockwise movement of the ring 115 will move arm 118 a like amount causing the clutch 29 to be engaged with sleeve 55 thereby re-starting the rotation of spindles 16. During this initial clockwise movement of ring 115, the cam groove 147 moves a corresponding amount to position the roller 146 in the position marked B (Fig. 6); and the roller 155 engages cam 157 to retract plunger 153 from opening 151. Further clockwise movement of ring 115 returns the parts to the positions shown in Fig. 3 whereupon valve 133 is actuated to engage clutch elements 70 and 71 to re-start the feeding of slide 13.

In order that the operator may more accurately position the control ring 115 to effect the sequential operation of the main driving clutch 29 and the feed clutch members 70 and 71, a bracket 158 is secured to the feed works base 15 having therein a spring-urged indexing point 159 (Fig. 4). An arcuate plate 160 secured to the control ring 115 is provided with 3 notched recesses 161, 162 and 163 to receive the point 159 when the control ring is in the desired positions.

Referring to Fig. 5, a spring-pressed detent 164 is mounted in the center of lever 118 that cooperates with recesses 165 and 166 on the under surface of the base 15, to yieldably hold the lever 118 stationary while the main clutch 29 is engaged or disengaged.

Although the various features of the improved machine tool have been shown and described in detail to fully disclose one embodiment of the invention, it will be evident that numerous changes may be made in such details,
62 and certain features may be used without others,
without departing from the principles of the invention.

64 1. A machine tool comprising in combination,
means for supporting a work piece; power-operated means for rotating said work-supporting means; means for supporting a tool; power-operated means for moving said tool into engagement with the work on said work-supporting means; and unitary manually-operable means including a member adapted to be moved in two directions for starting and stopping both of said power operated means in accordance with a predetermined sequential order.

2. A machine tool comprising in combination, means for supporting a work piece; means for supporting a tool adapted to be moved into engagement with the work on said work-supporting means; power-operated means for imparting separate motions to the work-supporting means and the tool-supporting means; and unitary manually-operable means including a member adapted to be moved in two directions for starting and stopping both of said motions in accordance with a predetermined sequential order.

3 21 In a machine tool, means adapted to support work
for movement; means adapted to support a tool

for movement toward and from said work support; driving means for moving said work and tool supports; means for starting and stopping one of said supports including an arm; a member adapted to be moved in two directions; and a connection between said arm and member including a lost motion connection that is effective at the beginning of motion of said member in one direction and at the end of motion of said member in the other direction.

45

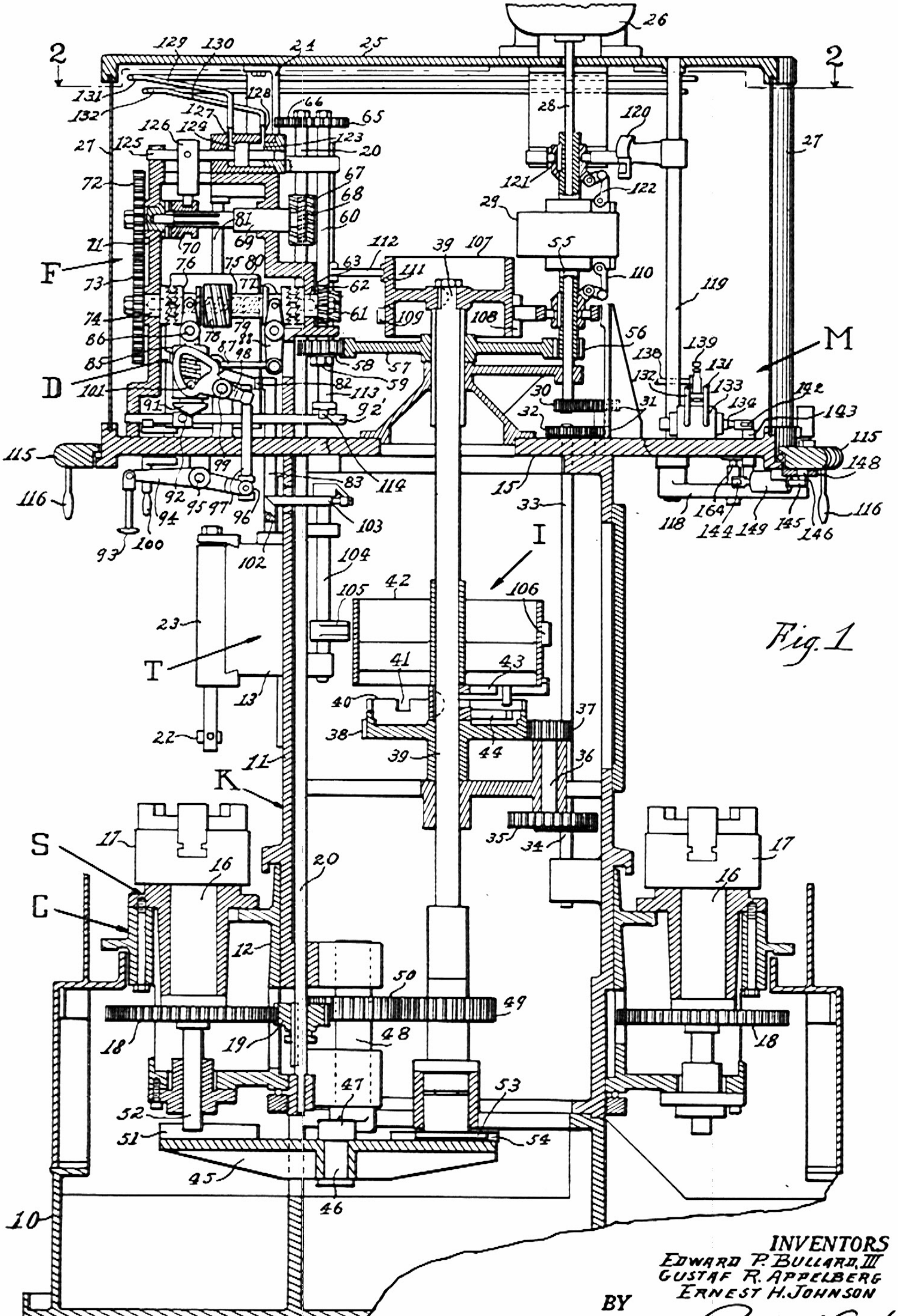

Fig. 1

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202834

3 Sheets Sheet 2

46

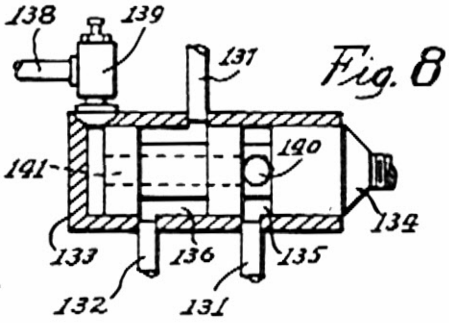

Fig. 8

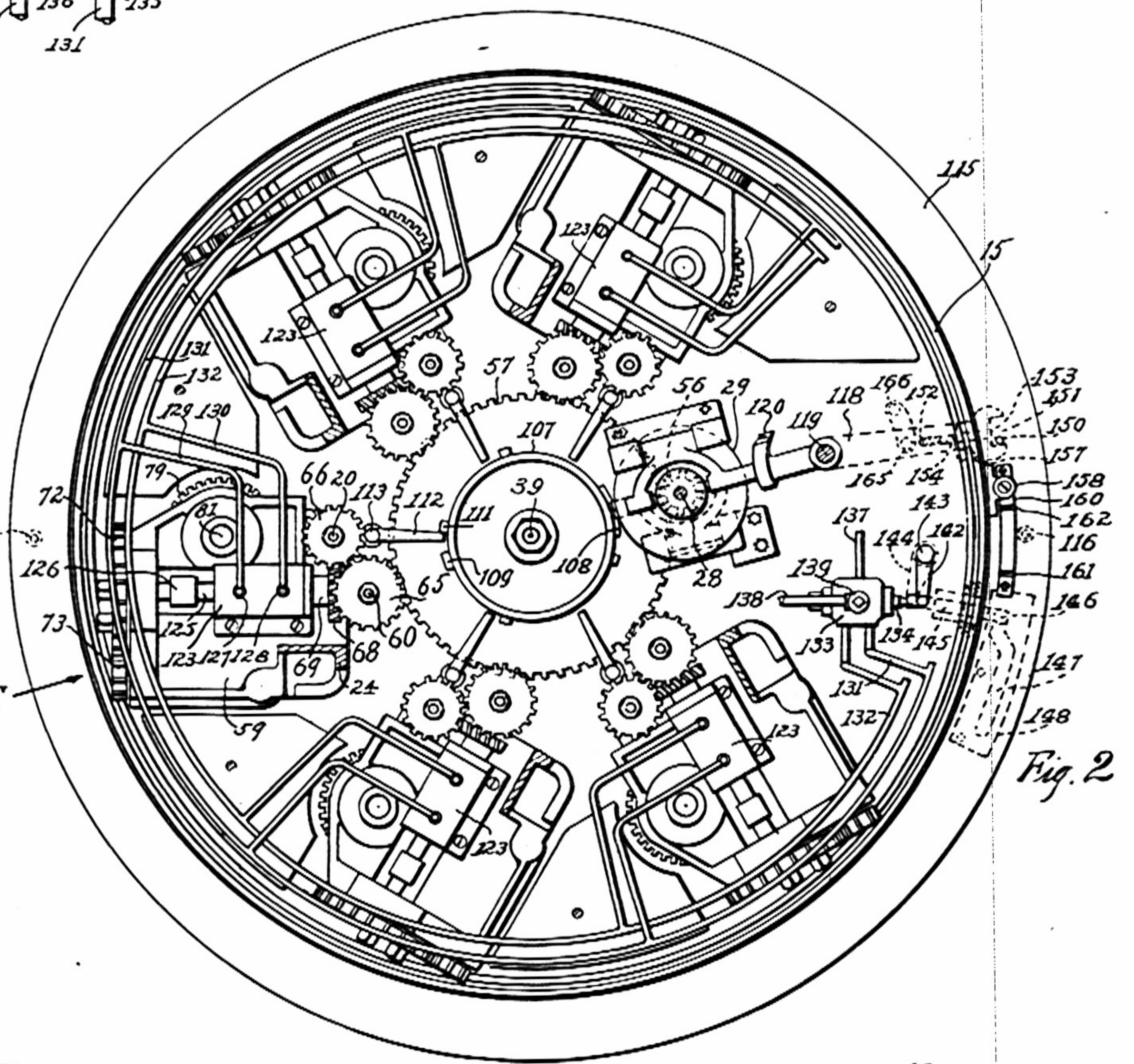

Fig. 2

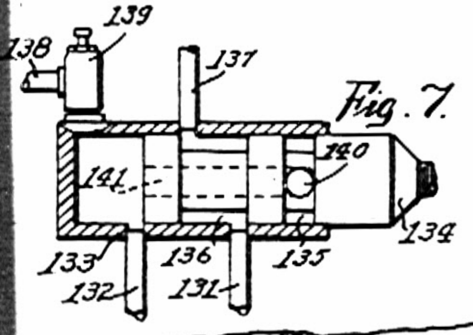

Fig. 7.

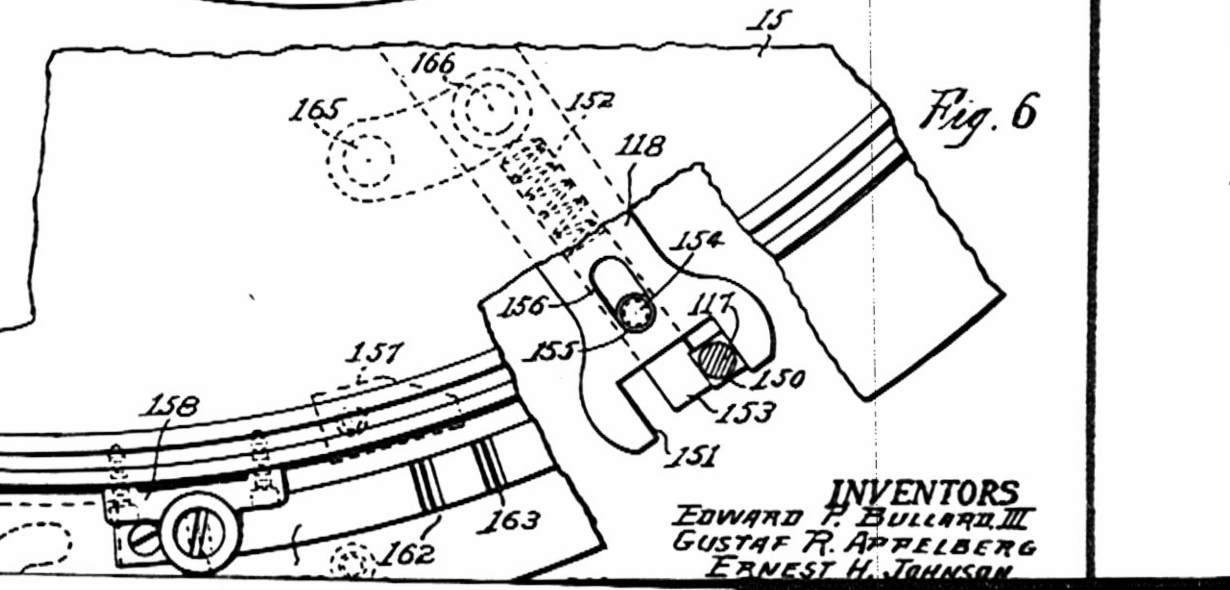

Fig. 6

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GUSTAF R. APPELBERG
ERNEST H. JOHNSON

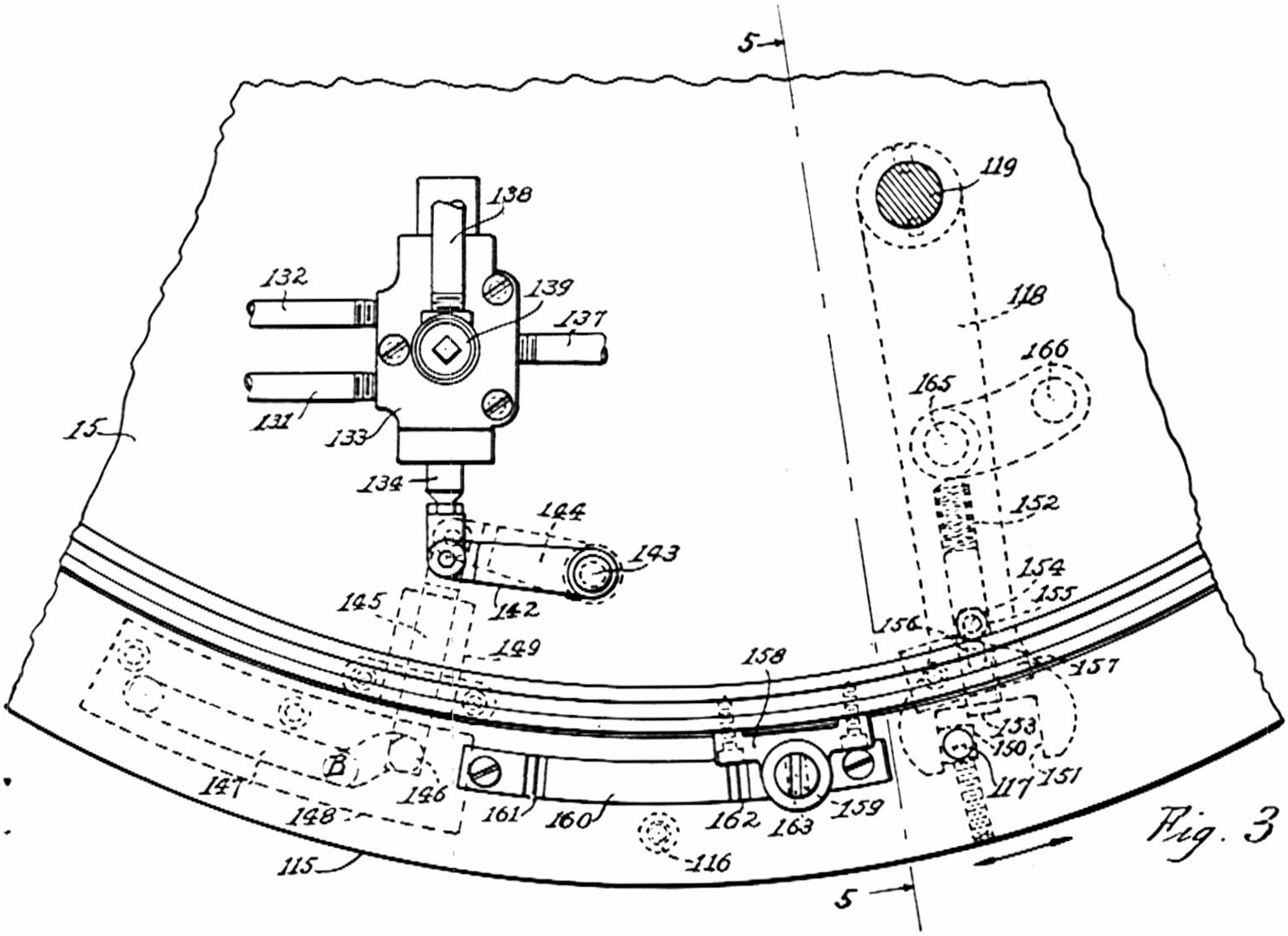

Fig. 3

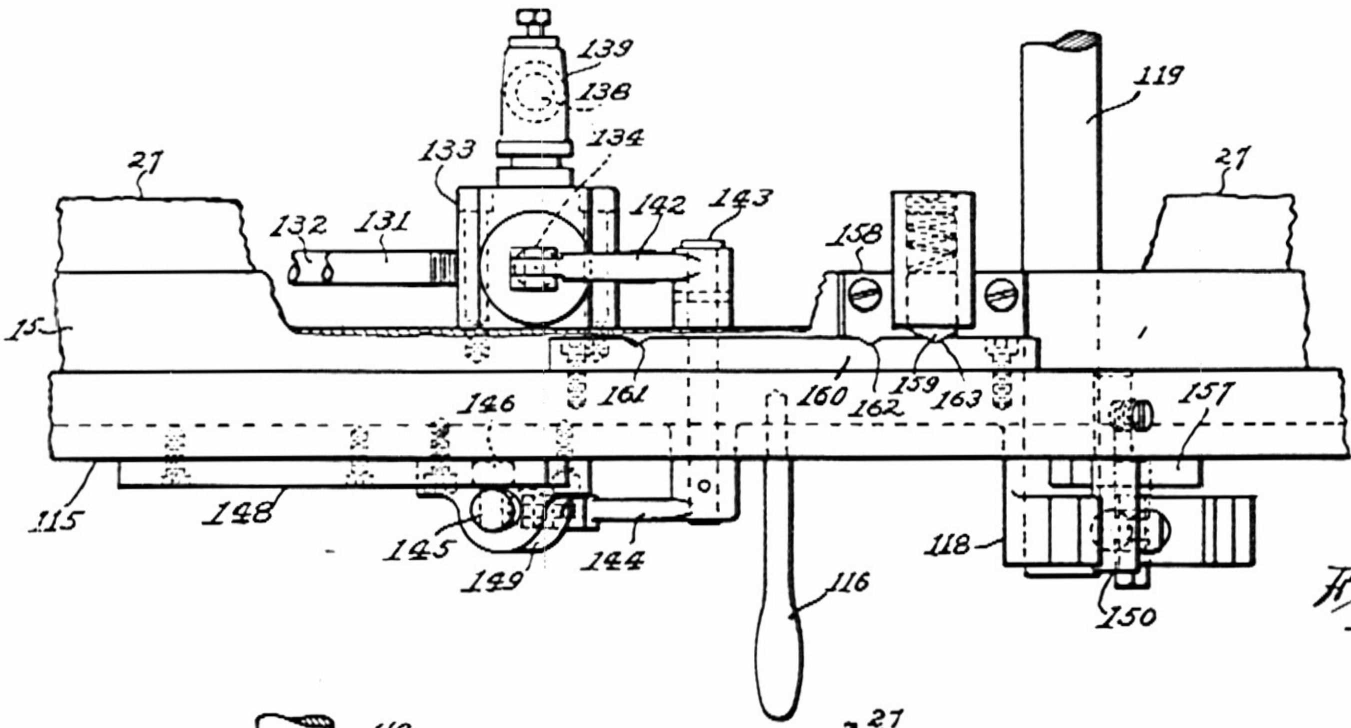

Fig. 4

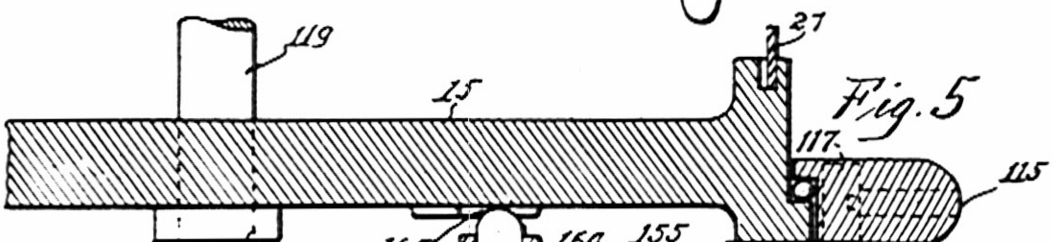

Fig. 5

INVENTORS
EDWARD P. BULLARD III
GUSTAF R. APPELBERG

Oath.

State of Connecticut)
)ss.:
County of Fairfield)

Edward P. Bullard, III, Gustaf R. Appelberg and Ernest H. Johnson, the above named petitioners, being duly sworn, depose and say that they are citizens of the United States and residents of Fairfield, Bridgeport and Bridgeport in the County of Fairfield and State of Connecticut, that they verily believe themselves to be the original, first and joint inventors of the improvements in Machine Tools described and claimed in the annexed specification; that they do not know and do not believe that the same was ever known or used before their invention or discovery thereof, or patented or described in any printed publication in any country before their invention or discovery thereof, or more than two years prior to this application, or in public use or on sale in the United States for more than two years prior to this application; that said invention has not been patented in any country foreign to the United States, on application filed by them or their legal representatives or assigns more than twelve months prior to this application; and that no application for patent on said improvement has been filed by them or their representatives or assigns in any country foreign to the United States.

Edward P. Bullard, III,
Gustaf R. Appelberg,
Ernest H. Johnson,

Sworn to and subscribed before me this 1st day of November, 1939.

Charles H. Barnes,
(Seal) *Notary Public.*

Com. expires 1940.

* * * * * * * * *

88 *Examiner's Statement.*

This is an appeal from the final rejection by the Primary Examiner of claims 1, 2, 6, 7, 21, 22 and 23. An amendment was filed on September 9, 1942, after the final rejection, amending claim 22. The amendment avoids the ground of rejection (functionality) of claim 22, and necessitates the citation of new art. This amendment is entered on condition that applicants do not assert their rights under ex parte Mevey 1891 C. D. 115 to further prosecute claim 22 before the Examiner. Claims 3, 4, 5 and 8 through 19 have been allowed.

The appealed claims are:

1. A machine tool comprising in combination, means for supporting a work piece; power operated means for rotating said work-supporting means; means for supporting a tool; power operated means for moving said tool into engagement with the work on said work-supporting means; and *unitary* manually-operable means including a member adapted to be moved in two directions for starting and stopping both of said power operated means in accordance with a *predetermined sequential* order.

2. A machine tool comprising in combination, means for supporting a work piece; means for supporting a tool adapted to be moved into engagement with the work on said work-supporting means; power operated means for imparting separate motions to the work-supporting means and the tool-supporting means; and *unitary* manually-operable means including a member adapted to be moved for starting and stopping both of said motions in accordance with a *predetermined sequential* order.

89 6. A machine tool comprising in combination, a rotatable work-supporting table; a tool support adapted to be moved toward and away from said table; and unitary manually-operable means including a member

adapted to be moved in one direction for starting the rotation of said table before starting the movement of said tool support and adapted to be moved in another direction for stopping the movement of said tool support before stopping the rotation of said table.

7. A machine tool comprising in combination, a work-supporting table; a tool support adapted to be moved toward and away from said table; a transmission for moving the tool support and for rotating said table in a definite relation; and *unitary* manually-operable means including a member adapted to be moved in one direction for starting the rotation of said table before starting the movement of said tool support and adapted to be moved in another direction for stopping the movement of said tool support before stopping the rotation of said table.

21. In a machine tool, means adapted to support work for movement; means adapted to support a tool for movement toward and from said work support; driving means for moving said work and tool supports; means for starting and stopping one of said supports including an arm; a member adapted to be moved in two directions; and a connection between said arm and member including a lost motion connection that is effective at the beginning of motion of said member in one direction and at the end of motion of said member in the other direction.

22. Apparatus comprising in combination, a first arm; a second arm; a member common to both arms adapted to be moved in two directions; and means operatively associated with said member and adapted to actuate said first arm at the beginning and said second arm at the end of movement of said member in one direction and to actuate said second arm at the beginning and said first arm at the end of movement of said member in the other direction.

23. In a machine tool, means adapted to support work for movement; means adapted to support a tool for move-

ment toward and from said work support; driving means for moving said work and tool supports; means for starting and stopping the movement of said work and tool supports in accordance with a determined order including an arm and lever respectively; and a member adapted to be moved in two directions adapted to actuate said arm at the beginning and said lever at the end of movement of said member in one direction and to actuate said lever at the beginning and said arm at the end of movement of said member in the other direction.

The references relied upon are:

Svenson	1,797,705	Mar. 24, 1931
Pearson	1,710,002	Apr. 23, 1929
Ellenwood	2,170,982	Aug. 29, 1939

The disclosed invention relates to metal working machine wherein the tool traverses the work while the latter is rotated. Referring to Figure 1 a workpiece or work
90 is clamped in the chuck 17 which is rotated by a drive transmission which need not be described. This drive transmission is controlled by the clutch 29, which in turn is actuated by *the arm 118* (see Figures 1 and 3) secured to the vertical shaft 119 (Figure 1) mounting the actuating cam 120. The toolholder 13 and the tool 22 are reciprocated by a drive transmission that need not be described. This drive transmission for the tool is controlled by the valve 133 (see Figures 1 and 3) having a piston 134 actuated by the reciprocating *rod 145* through the bellcrank 142, 143, 144 (see Figures 3 and 4). A manually operable ring 115 (see Figures 1 and 3) is journaled on the fixed base plate 15 for oscillation thereabout. This ring has what may broadly be called a lost motion connection with both the control arm 118 for the work and the control rod 145 for the tool. The lost motion connections need not be described since the claims on appeal do not set forth any structure of the same. The lost motion connections are arranged to

produce a definite sequential operation of the work and the tool, namely to start the work rotating before starting the feeding of the tool, and to stop the tool feed prior to stopping the rotation of the work. This specific sequence of operation is essential. It is stated in the specification that a simultaneous stopping of the work and the tool feed results in the tool point being buried in the work. This same result will occur if the work (i.e. the rotation) is stopped prior to the stopping of the tool feed. If the tool point is buried in the work, a subsequent starting of the latter will require excessive forces for the transmission to overcome, a probable breaking of the tool point, and chattering of the tool with attendant marking of the work.

91 Claims 1, 2 and 23 are finally rejected as broader than the disclosed invention. These claims include power operated means for rotating the work and power operated means for moving the tool into engagement with the work. They further include a manually-operable means including a member adapted to be moved in two directions "for starting and stopping both of said power operated means in accordance with a predetermined sequential order". It is submitted that this latter limitation is broader than the disclosed invention. It will be recalled that the problem is to prevent the tool point from being buried in the work when the two feeds are stopped because if the tool point is buried in the work then a subsequent starting of the latter will require (1) excessive forces for the transmission to overcome, (2) a probable breaking of the tool point, and (3) chattering of the tool with the attendant marking of the tool. The only way in which this problem is solved, according to the instant disclosure, is to start the rotation of the work prior to starting the feeding of the tool to the work, and to stop the tool feed prior to the stopping of the rotation of the work. The limitation in these claims "in accordance with a predetermined sequential order" is broad, and reads equally well on the exact reverse

of the operation disclosed, namely on a structure wherein the tool is fed to the work prior to starting the rotation of the work, and the stopping of the rotation of the work prior to stopping the tool feed, thereby producing the very result which applicants are attempting to avoid. Since this limitation in the claims is the definition of the invention in the combination, it is submitted that claims 1, 2 and 23 are broader than the disclosed invention.

The rejection of claim 21 on the same ground is withdrawn.

92 Claims 1 and 2 are further finally rejected on Svenson. This reference discloses a rotatable work spindle 21 and a movable tool holder 13. The work spindle 21 is controlled by the clutch 29 (Figure 2), engaged and disengaged by the axially shiftable rod 30, which in turn is actuated by the rockable shaft 66 through the pin 68 (Figure 5). The tool holder 13 is controlled by the clutch 36 (Figure 2), engaged and disengaged by the shiftable actuator rod 37, which in turn is actuated by the rockable shaft 70 (Figure 5) through the segmental gear 72 (Figures 5 and 6). A control member 78 (see Figures 5, 6 and 1) is movable in two directions to start and stop the two power operated means in accordance with the predetermined sequential order described on page 2, lines 17 through 32, this order being the same as in the instant case, namely to start the work spindle rotating before starting the work feed of the tool slide, and to stop the latter prior to stopping the former. The member 78 is secured to the carriage 13 and is manually operable by the hand wheel 61, through the pinion-rack 64, 63, and bar 43 which is secured to the carriage 13. It is submitted that claims 1 and 2 are fully met in terms by this reference since the manually-operable means includes a member 78 adapted to be moved in two directions for starting and stopping both of the power operated means in accordance with a predetermined sequential order. If desired the member 78 may be disconnected from

the carriage 13 and manually moved directly by means of a handle extension, without the exercise of invention.

Claims 6 and 7 are finally rejected on Svenson. This reference discloses all the structure that is postively set forth in the claims, namely a rotatable work supporting table 21, a tool support 13 adapted to be moved toward and away from the table and a unitary manual operable means
93 61 including a member 78 adapted to be moved in two directions to start the rotation of the table before starting the movement of the tool support (i.e. the working feed), and for stopping the movement of the tool support before stopping the rotation of said table. The sole difference presented by these claims *is expressed in terms of function.* No structural differences are set forth. Thus in the reference the movement of the tool support is stopped on the continued movement of the member 78 in the first mentioned direction rather than at the start of the return movement of the member 78. It is submitted that this difference expressed in terms of function rather than in terms of structure is not a patentable distinction, particularly where the reference shows the same sequential order of starting and stopping the work suporting table and the tool support.

Claim 21 is finally rejected on Svenson. This claim includes driving means for moving the work and tool supports, but does not recite the sequential order of starting and stopping the two supports. There is included in the claim a means including an arm for starting and stopping one of these supports. The corresponding structure in the reference is the means for starting and stopping the tool support 13, and this means includes an arm 71. This claim further includes a member adapted to be moved in two directions, which is the member 78 in the reference. The "connection between said arm and member including a lost motion connection" recited in the claim is the connection 84, 81, 80, 91 and 90 shown in Figure 6

of the reference that is effective at the beginning of motion of the member 78 in one direction (to the left). The sole difference presented is in the functional limitation stating
that the connection is effective at the end of motion
94 of the member in the other direction. In the refer-
ence, it will be remembered, the connection for the tool support is effective at the end of motion of the member 78. It is submitted that this difference, expressed as a function and not structurally, is not patentable. The reference discloses all the structure set forth, namely: the driving means for the two supports, the means for starting and stopping one of the supports including an arm, a member adapted to be moved in two directions, and a connection between said arm and member including a lost motion connection. In addition it is pointed out that this functional difference lacks utility in the combination set forth because the sequential order of starting and stopping the two supports is not included. Where the structure included is for starting and stopping only one of the supports, as in this claim, what practical difference is there when the connection is rendered effective with reference to the direction of movement of the control member? This claim is deemed to be unpatentable over Svenson not only because the difference is expressed in terms of function rather than in terms of structure, but also because the functional difference lacks utility in the combination set forth, over the reference disclosure.

Claim 22 was finally rejected as functional and therefore indefinite. This ground of rejection is withdrawn in view of the entry of the amendment of September 5, 1942, filed after the final rejection. Claim 22, however, is unpatentable over the patent to Pearson. Applying this reference to the claim, the apparatus shown in Figures 4 and 5 comprises a first arm 53, a second arm 54, and a member (the disc provided with the arm 46 and handle 57) common to both arms and adapted to be moved in two directions (clockwise

and counterclockwise about the pivot 40), and means 42-44-51, 43-45-54 operatively associated with said
95 member and adapted to have the same function set forth.

Thus starting from the position shown in Figure 5, as the handle 47 is moved counterclockwise (in one direction), it actuates the first arm at the beginning until the position shown in Figure 4 is reached due to the pin 51 riding in the slot 44 (the second arm 54 being stationary since the pivot 52 rides in the slot 43 concentric with the member axis 40), and then actuates the second arm 54 at the end of its movement in the counterclockwise direction due to the pin 52 now riding in the slot 45 (the first arm 53 being stationary during this movement due to the pin 51 riding in the slot 42 concentric with the axis 40). It is obvious that a return movement of the handle in a clockwise direction from the extreme right hand position to the position shown in Figure 5 (namely the movement in the other direction recited in the claim) will actuate the second arm 54 at the beginning and the first arm 53 at the end of movement of the member in the other direction. Claim 22 is fully met in terms by Figures 4 and 5 of Pearson.

Claim 22 is fully met in terms by Ellenwood. In this reference a first arm is yoke F, a second arm is yoke H, the member common to both arms and adapted to be moved in two directions is 16, and the means operatively associated with said member are the shaft B mounting the eccentrics C and D which cooperate with the yokes F and H respectively. The yokes F and H are connected to the members 18 and 20 respectively, which latter members may also be regarded if desired as being the first and second arms. However, the yokes F and H are regarded as the two arms for simplicity sake in the application of the reference. Each of the eccentric cams C and D has a surface that is concentric with the shaft B. It is apparent that these concentric surfaces transmit no movement to their cooperating
96 yoke. The operation is obvious, when the member

16 is moved clockwise in one direction from the extreme left position shown in Figure 4, it actuates the first arm F at the beginning and the second arm H at the end of movement of said member, and when moved in the other direction counterclockwise, it actuates the second arm H at the beginning and the first arm F at the end of movement in said other direction. Claim 22 is fully met by Ellenwood.

For the foregoing reasons, the final rejection of claims 1, 2, 6, 7, 21, 22 and 23 is believed to be proper and should be affirmed.

* * * * * * * * *

129 Mailed Mar. 9, 1943, U. S. Patent Office,
Board of Appeals.

IN THE UNITED STATES PATENT OFFICE

BEFORE THE BOARD OF APPEALS.

Ex parte Edward P. Bullard, III,
Gustaf R. Appelberg and
Ernest H. Johnson

Application for Patent filed November 4, 1939,
Serial No. 302,834. Machine Tools.

Mr. Paul M. Geist for applicants.

The applicants have appealed from the action of the examiner finally rejecting claims 1, 2, 6, 7, 21, 22 and 23.

Appellants have withdrawn the appeal with respect to claim 22 and the same will accordingly be dismissed.

Claim 1 may be taken as an example.

1. A machine tool comprising in combination, means for supporting a work piece; power operated means for rotating said work-supporting means; means for supporting a tool; power operated means for moving said tool into engagement with the work on said work-supporting means; and unitary manually-operable means including a member adapted to be moved in two directions for starting and stopping both of said power operated means in accordance with a predetermined sequential order.

130 The references relied upon are:

Pearson,	1,710,002,	Apr. 23, 1929,
Svenson,	1,797,705,	Mar. 24, 1931,
Ellinwood,	2,170,982,	Aug. 29, 1939.

The disclosure relates to machine tools of the type that employ separate motions between the tool and work during metal working operations, particularly to apparatus for starting and stopping the movements of the tool and work in accordance with a predetermined sequential order. According to the disclosure, the member 17 is used to clamp the work in operative position and is rotatable by mechanism described in the application. The tool holder 13 and the tool 22 carried thereby are reciprocated by a disclosed drive transmission. The work and the tool and the order of their being brought into operation are controlled by a manually operable ring 115. The examiner explains that this ring is what may be called a lost motion connection with the control arm 118 for the work and the control rod 145 for the tool, as may be seen in more detail in Fig. 6 of the drawing. The examiner also points out that the lost motion connections are arranged to produce a definite sequential operation of the work and the tool, that is, to start the work rotating before starting the feeding of the tool and to stop the tool feed prior to stopping the rotation of the work.

The examiner has rejected claims 1, 2 and 23 as broader
than the invention in that these claims include power oper-
ated means for rotating the work and power operated means
for moving the tool into engagement with the work and that
they further include a manually operable means adapted to
be moved in two directions for starting and stopping both
of the power operated means in accordance with a
131 predetermined sequential order. It is the examiner's
position that this limitation is broader than the in-
vention disclosed and would read equally well on the exact
reverse of the operation disclosed.

Appellants argue that the specific sequential order of operating the power operated means is dependent upon the construction of the machine to which the principles of the invention are applied and that it is entirely within the scope of the invention to apply the control to a machine tool in which the tool head T is fixed against rectilinear movement and the tool used is a rotatable one such as a drill, reamer or the like, the rotation of which may be controlled by an additional clutch in the shaft 20.

It is considered that appellants are entitled to draw their claims broader than the specific form disclosed subject to the art.

Claims 1, 2, 6, 7 and 21 have been rejected on the patent to Svenson. The examiner has applied the reference to these claims beginning at the top of page 5 of his statement discussing the detailed structure thereof and how it is applied and it is considered unnecessary to repeat this detailed structure here.

Appellants argue that the patent to Svenson is inoperative in that portion thereof that is required to anticipate the claims and that the only portion that is at all pertinent to applicants' invention is that illustrated in Figs. 5 and 6. It is argued that contrary to what the examiner alleges, the reciprocable member 78 of Svenson is not capable of move-

ment in two directions for starting and stopping the two
power means, that is the clutch 29 for the work and
132 36 for the tool, in a predetermined sequential order.
It is stated in the brief that the member 78 of Svenson is operatively movable in only one direction and then only to engage clutch 29 to engage 36 and disengage clutch 36 in the sequence named. Appellants contend that it is impossible to move the bar 78 rightwardly to disengage 29 because the disc 71 has already been returned to its original position whereat the free end of the bar 90 will engage the outer peripheral portion of the shoulder 91 and prevent counterclockwise movement of the disc 80 and, consequently, the disengaging of clutch 29 by the bar 78.

It is not clear that the free end of the bar 90 will engage the outer peripheral portion of the shoulder 91 and prevent counterclockwise movement of the disc 80 to prevent disengaging the clutch 29 by the bar 78. In the specification of the patent on page 5 it is stated that the clutch engaging movement of the feed control disc 71 has moved the arm 90 to such a position that the end of the arm is free to swing past the abutment on the main clutch control disc so that upon engagement of the feed stop 95 with the lug 96, the disc is swung in a return direction to disengage the feed clutch without affecting the spindle control mechanism and that in this manner the tool supports may be automatically disengaged from the feed drive at the completion of the work cut to permit the supports to be returned to their remote position by the manual control mechanism. The disc 71 is under control of an operating handle 74 which may be operated to return this disc 71 to position so that the arm 90 is free to swing back past the abutment on the
main control disc before it becomes locked according
133 to appellants' interpretation of the operation. It is
stated also in the patent that the return movement of the tool supports under manual control moves the rear star wheel 85 into engagement with the depending pin 82 to

effect a reverse rocking movement of the main clutch control disc 80 to disengage the main clutch and stop the spindle. It is considered, therefore, that the rejection of claims 1, 2, 6, 7 and 21 on the patent to Svenson is proper.

Claim 23 does not appear to have been rejected on the Svenson patent and since we are not affirming the rejection of this claim as broader than the invention, it stands allowed.

The appeal is dismissed as to claim 22.

For the reasons indicated, the decision of the examiner is affirmed as to claims 1, 2, 6, 7 and 21, but is reversed as to claim 23.

W. L. Redrow,
Examiner-in-Chief.
E. T. Morgan,
Examiner-in-Chief.
F. J. Porter,
Examiner-in-Chief.
BOARD OF APPEALS.

March 9, 1943.

Mr. Paul M. Geist,
Patent Dept.,
The Bullard Co.,
Bridgeport, Conn.

141 *On Request For Reconsideration.*

Appellants have requested reconsideration of our decision dated March 9, 1943, with respect to claims 1, 2, 6, 7 and 21 because it is said to be based upon an erroneous interpretation of the method of operating the structure disclosed in the Svenson patent.

It is argued that the proposal to manually operate the hand lever 74 to move the disc 71 in a counterclockwise direction sufficiently to permit the outer peripheral portion of shoulder 91 to clear the free end of bar 90 cannot

be done, first because of the lost motion provided between the bar 90, surface 89 and the spring 92 that normally
142 separates the bar and surface, disc 71 would have to be moved in a counterclockwise direction farther than is necessary to effect complete engagement of clutch 36 to permit shoulder 91 to clear it. It is considered that this reason amounts to mere speculation and that it is not disclosed how great a movement would be necessary.

It is also stated that any attempt to turn disc 71 counterclockwise by lever 74 would cause pin 96 to interfere with stop 95. It is not seen that this would necessarily follow.

It is also stated that manual movement of disc 71 counterclockwise would cause clutch 36 to be re-engaged, thereupon re-starting the feed movement of the carriage 13 toward the left with damaging results. Of course, whether the clutch 36 would be re-engaged would depend upon the amount of counterclockwise movement. This suggestion was made merely in an attempt to show that applicants had not established a case of inoperativeness of the patent device. After the above mentioned reasons are given, applicants say that if the suggestion could be accomplished, the claims would not be anticipated.

With respect to claims 1 and 2, it is stated that they have the limitation, unitary manually-operable means including a member adapted to be moved in two directions for starting and stopping both of said power-operated means in accordance with a predetermined order. It is noted that Svenson shows a manually-operable means including a hand wheel 61, member 43 and bar 78. The patentee states that by means of his hand wheel, movement of the front carriage toward or away from a piece of work may be effected. Since this mechanism is adapted to be moved in two directions and ultimately accomplish the starting and
143 stopping in accordance with some stated order, these claims are considered unpatentable.

Claims 6 and 7 appear to distinguish from the reference in calling for a member adapted to be moved in another direction for stopping the movement of the tool support before stopping the rotation of the table and on reconsideration, it is considered that these claims are allowable.

Claim 21 is still considered unpatentable. This claim does not set out in what manner the lost motion is effective in the other direction.

For the reasons given in our decision and herein, the rejection is affirmed as to claims 1, 2 and 21 and is reversed as to claims 6 and 7. The petition is granted to the extent indicated.

E. T. Morgan,
Examiner-in-Chief.
W. L. Redrow,
Examiner-in-Chief.
F. J. Porter,
Examiner-in-Chief.
BOARD OF APPEALS.

April 1, 1943.

Mr. Paul M. Geist,
Patent Dept.,
The Bullard Co.,
Bridgeport, Conn.

March 24, 1931. E. J. SVENSON 1,797,705

MACHINE TOOL

Filed Sept. 17, 1928 3 Sheets-Sheet 1

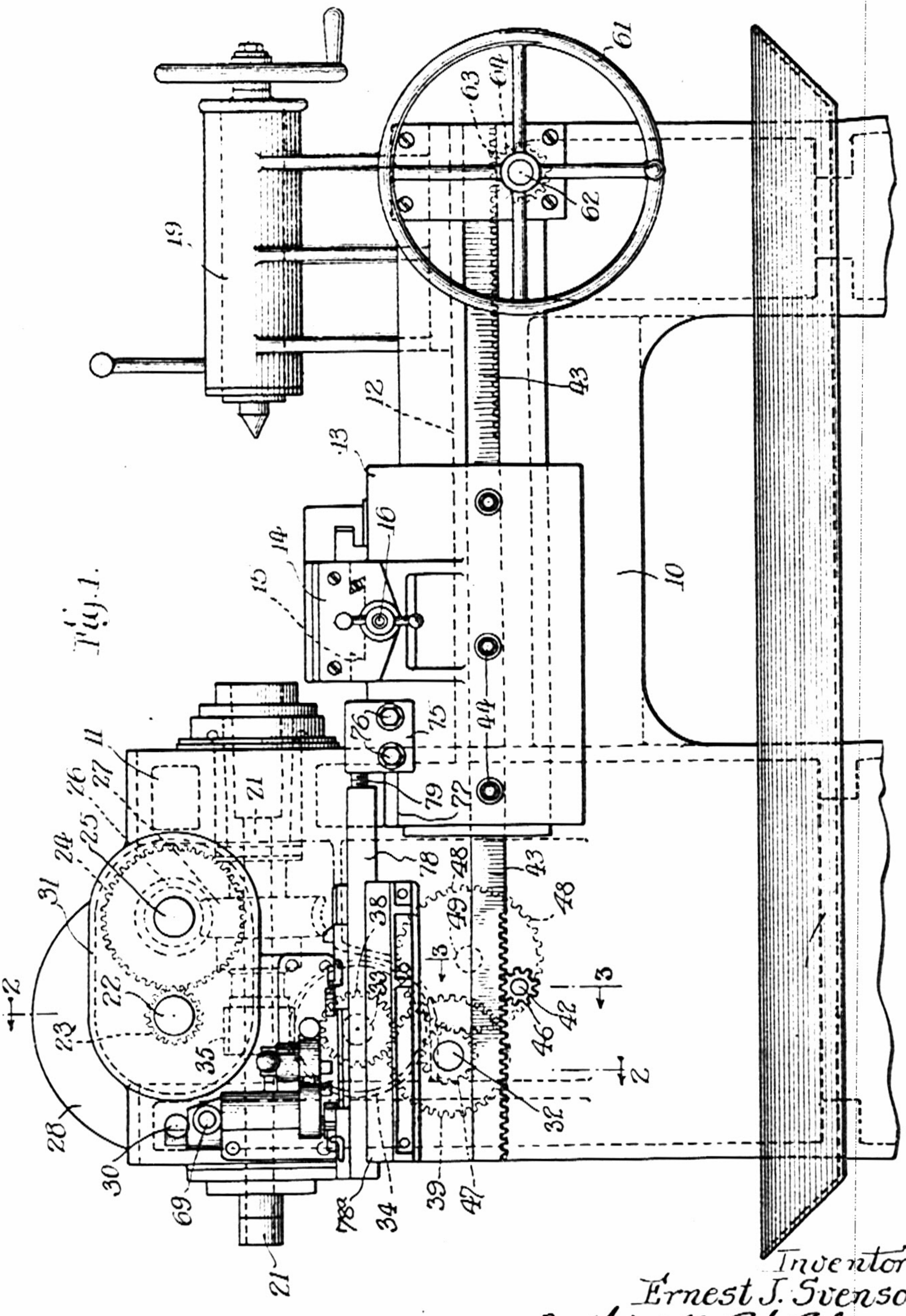

Fig. 1.

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By Chindahl Parker Carlson Attys

66

March 24, 1931. E. J. SVENSON **1,797,705**

MACHINE TOOL

Filed Sept. 17, 1928 3 Sheets-Sheet 2

Fig. 2.

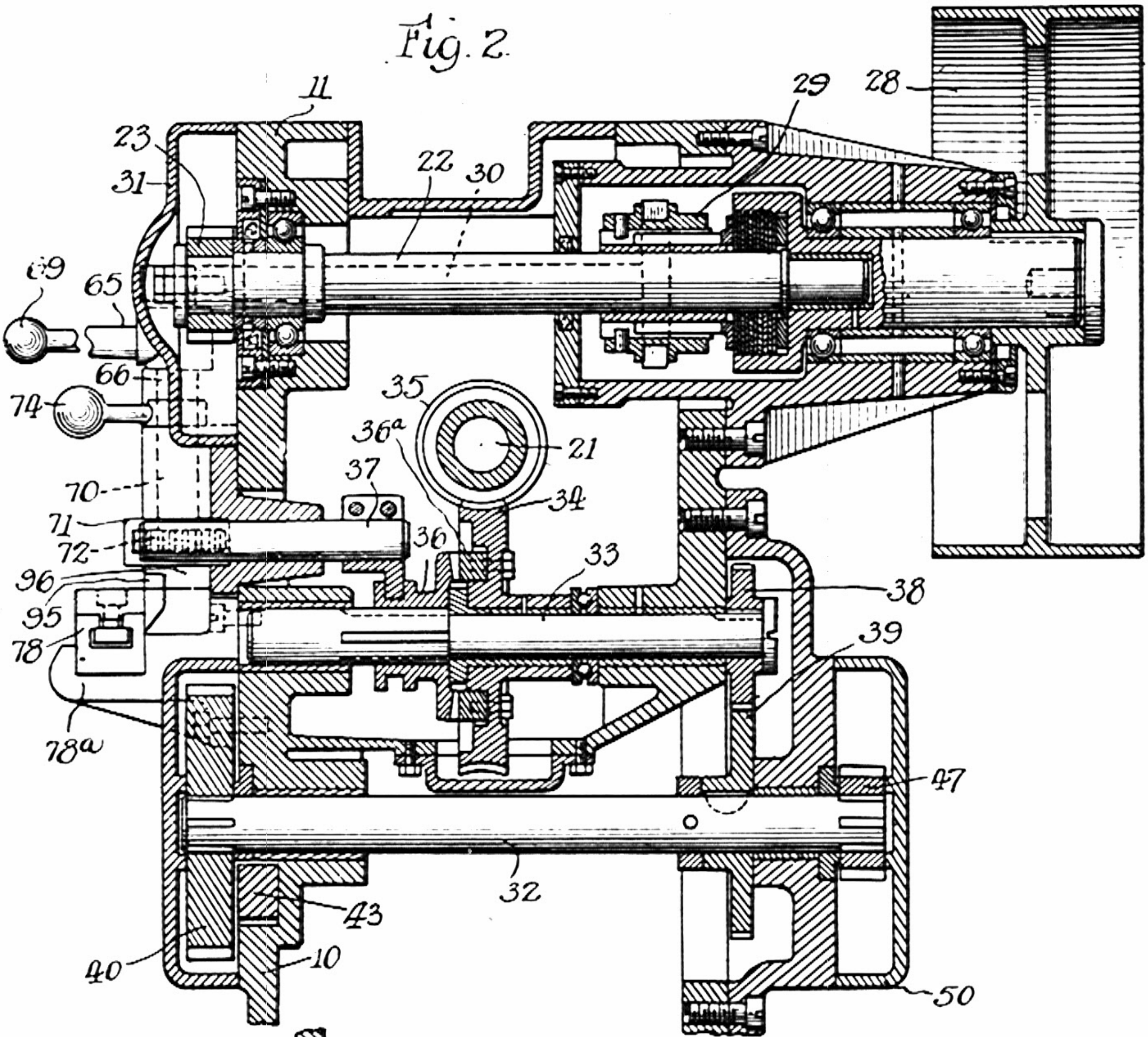
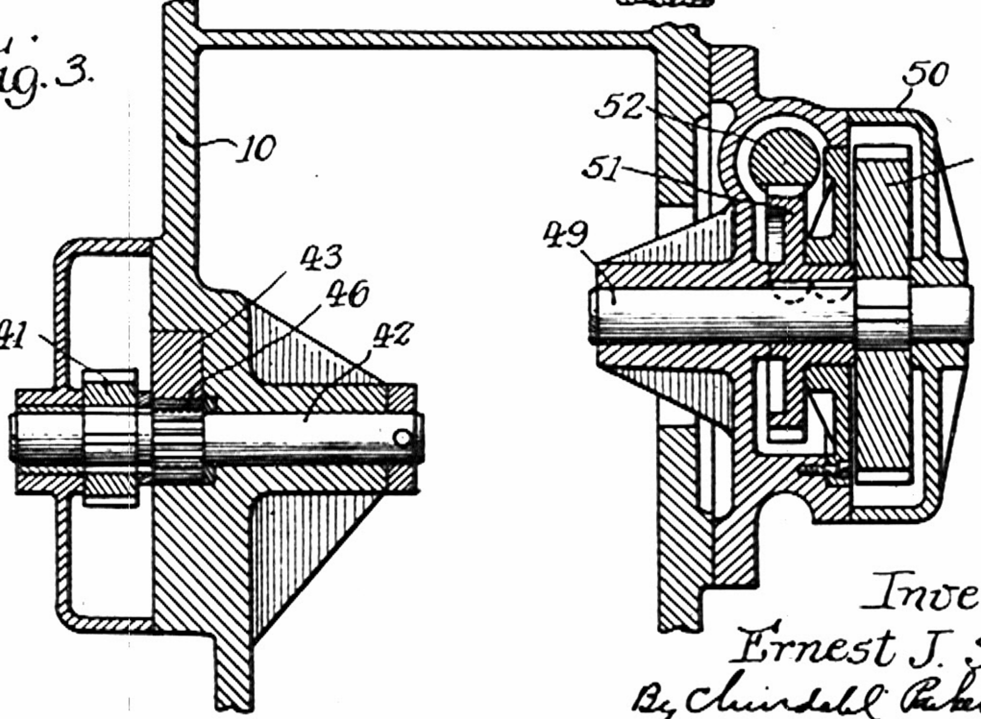


Fig. 3.



Inventor:
Ernest J. Svenson,
By Chindahl Parker Carlson
Attys.

67

March 24, 1931. **E. J. SVENSON** 1,797,705

MACHINE TOOL

Filed Sept. 17, 1928 3 Sheets-Sheet 3

Fig. 4.

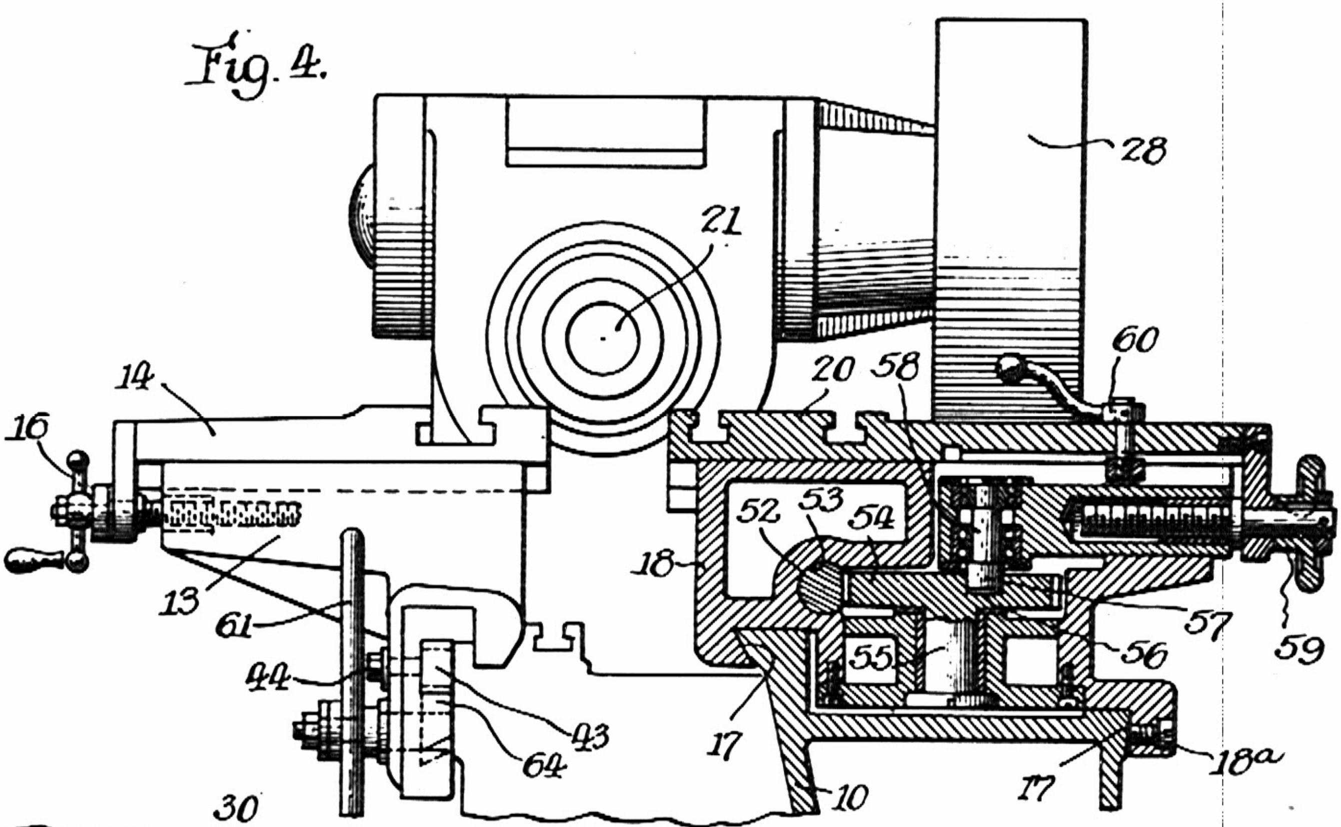


Fig. 5a.

Fig. 5.

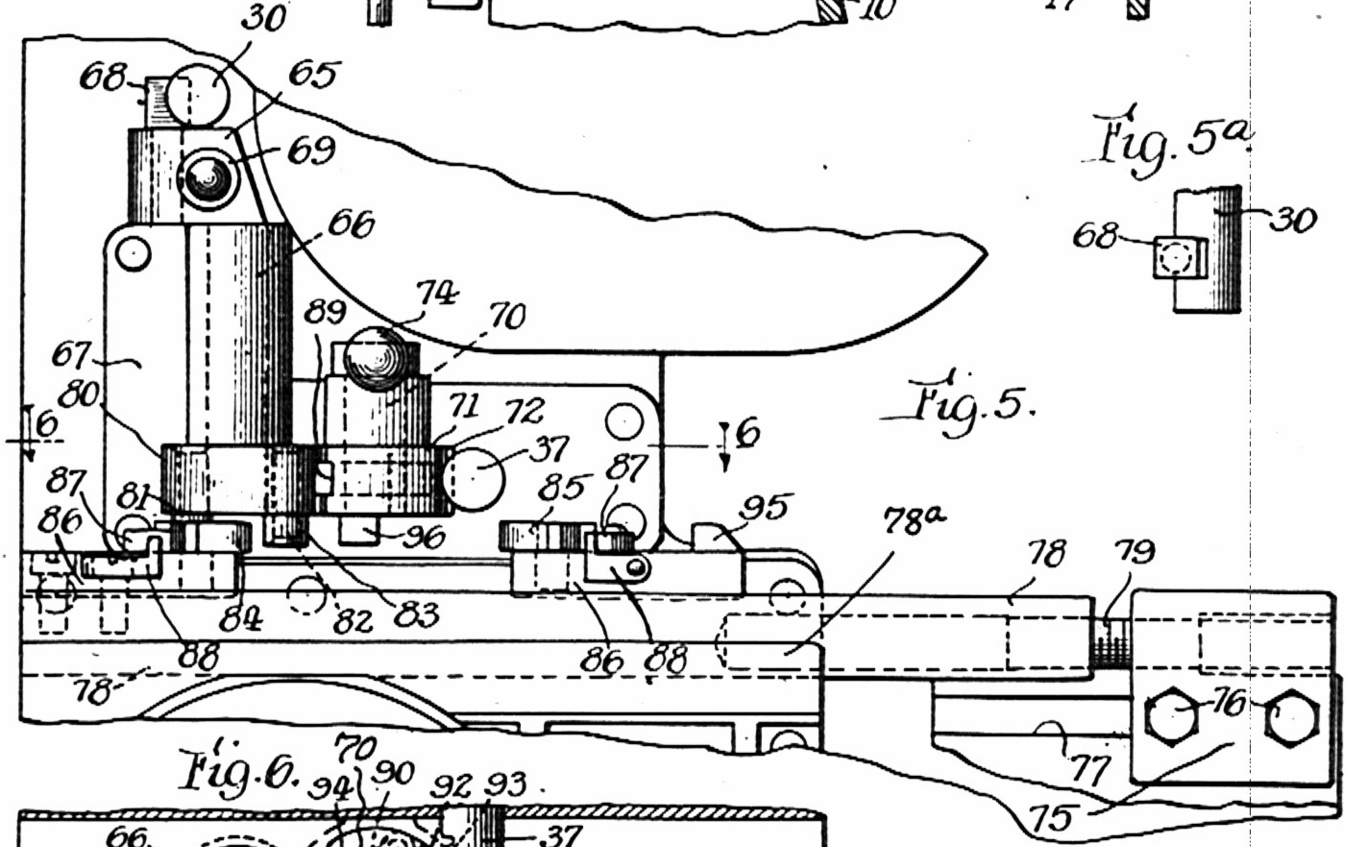
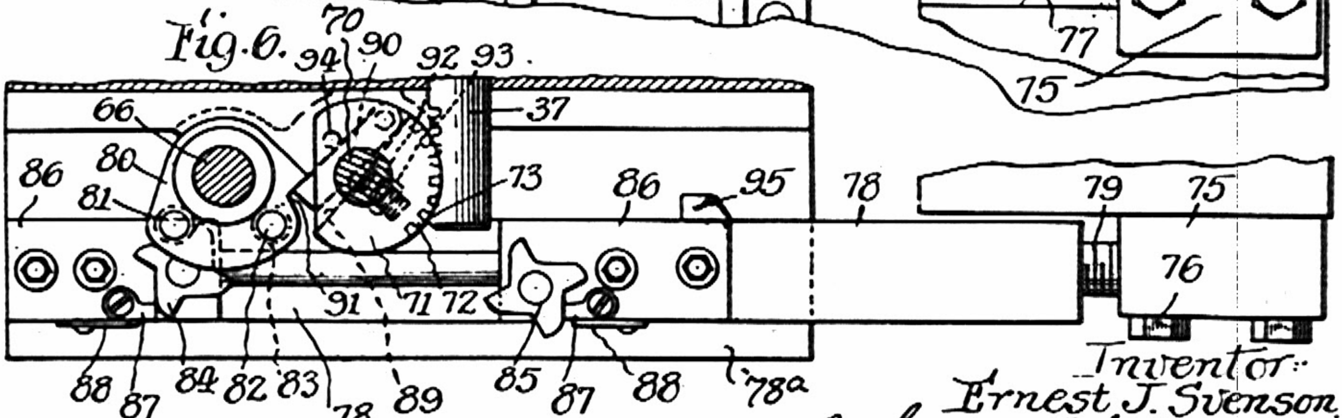


Fig. 6.



Inventor:
Ernest J. Svenson.
By Chindahl Parker Carlson Attys.

Patented Mar. 24, 1931 1,797,705

UNITED STATES PATENT OFFICE

ERNEST J. SVENSON, OF ROCKFORD, ILLINOIS, ASSIGNOR TO SUNDSTRAND MACHINE TOOL CO., OF ROCKFORD, ILLINOIS, A CORPORATION OF ILLINOIS

MACHINE TOOL

Application filed September 17, 1928. Serial No. 306,306.

The invention relates to machine tools and more particularly to a substantially automatic lathe adapted to perform a plurality of operations on a work piece and to provide a high rate of production.

It is the general object of the invention to provide a lathe of new and improved construction embodying a simplified mechanism for actuating a plurality of tool supports and which is particularly efficient in operation and lends itself readily to manufacture at a low cost.

Another object of the invention is to provide a lathe which is automatic, except for certain of its movements which are capable of being most rapidly performed manually, and which embodies a simple control mechanism adapted in the cycle of operation of the machine automatically to transfer the control of the movement of the tool supports, first from the manual to the automatic means and then back to the manual means.

Another object of the invention is to provide a lathe embodying novel means manually operable to advance and return the front carriage and rear tool support.

A further object auxiliary to the foregoing object resides in the provision of means operable during the manual operation of the front carriage automatically to supplant the manually operable means by a power drive for the carriage immediately prior to the engagement of the tools thereon with the work piece.

A further object of the invention is to provide a lathe of this character embodying a combined manual and automatic control for the tool supports arranged so that during a manually operated approach of the tools toward the work piece the spindle is started as the tools near the point of engagement with the work and subsequently the feed drive is engaged just before the engagement of the tools with the work to feed the tools at a cutting speed during the cutting operation, after which the feed drive is automatically disengaged to permit a manual return movement of the tools, during which movement the spindle is stopped.

Another object of the invention is the provision of an improved lathe of this character embodying a single feed shaft for moving the front carriage and the rear cross slide to and away from the piece of work and including change speed means for varying the stroke of each independently of the other.

Additional objects and advantages will become apparent as the description proceeds as well as from the accompanying drawings in which:

Figure 1 is a fragmentary front elevation of a preferred form of the invention with the pick-off gears and gear casing for the front carriage removed.

Figs. 2 and 3 are fragmentary vertical sections through the head stock taken on the lines 2—2 and 3—3 of Fig. 1 respectively.

Fig. 4 is a fragmentary tail end view with the tailstock removed, showing the rear carriage and cross slide in section.

Fig. 5 is a fragmentary front elevational view on an enlarged scale showing in detail the exemplary form of automatic control means.

Fig. 5ª is a detail view of the operating connection for the main clutch.

Fig. 6 is a horizontal sectional view of the control means taken on the line 6—6 of Fig. 5.

While the invention is susceptible of various modifications and alternative constructions, I have shown in the drawings and will herein describe in detail the preferred embodiment, but it is to be understood that I do not thereby intend to limit the invention to the specific form disclosed, but intend to cover all modifications and alternative constructions falling within the spirit and scope of the invention as expressed in the appended claims.

In attaining the objects, the invention con-

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templates the provision of a simplified feed mechanism which includes a clutch controlled driving shaft for operating the spindle and also serving to drive a clutch controlled feed shaft. The feed shaft in turn effects a feeding movement of the front carriage and of the rear cross slide in a feeding direction only, the rear carriage and front cross slides being adjustable manually as required by a particular piece of work. A manually operable means for rapidly moving the front carriage and the rear cross slide in either direction is provided in connection with the feed mechanism to permit the rapid approach and the rapid return movements of the front carriage and rear cross slide to be effected by hand.

Also associated with the feed mechanism is a control means which operates upon the movement of the front carriage to a predetermined point near the work piece, first to actuate the main clutch to start the spindle and the feed shaft and subsequently to move the feed clutch into engagement to drive the front carriage and rear cross slide through the feed stroke. The control means is further operable, upon completion of the cutting operation to effect the disengagement of the feed clutch to stop the carriage and, at the start of the manually operated rapid return of the carriage, to disengage the main clutch to stop the spindle.

More particularly described, referring to Fig. 1, the invention comprises generally a bed 10 having a headstock 11 preferably formed integrally therewith. The bed is provided with longitudinal ways 12 along the forward face thereof upon which a front carriage 13 is movably mounted. This carriage has a cross slide 14 mounted on suitable ways 15 thereon for adjustment transversely of the lathe. For this purpose a generally well-known type of adjusting screw 16 is employed. The bed is also provided with a pair of ways 17 (Fig. 4) along the rear upper surface thereof upon which a rear carriage 18 is adjustably mounted. Such means as the set-screws 18^a may be provided to maintain the rear carriage in any of its positions of adjustment. The rear carriage carries a rear cross slide 20 thereon, which is mounted for driven movement as will hereinafter become apparent. Intermediate the ways for the front and rear carriage is positioned a set of ways (not shown) upon which a tailstock 19 may be adjustably supported.

A work spindle 21 is rotatably supported in longitudinally spaced bearings in the headstock 11 and is arranged to be driven from a main drive shaft 22 (Fig. 2), which extends transversely of the lathe, by means including a pair of pick-off gears 23, 24, a shaft 25 and the worm and worm wheel 26 and 27. The main drive shaft 22 is arranged to be driven by means of a pulley 28 which in this embodiment is journaled in the headstock and is adapted to be connected to the shaft by means of a main clutch 29 controlled by a shiftable actuator rod 30. The shaft 25 is journaled in the headstock parallel to the main drive shaft with the pick-off gears 23, 24 splined onto the forward ends of the shafts 22 and 25 in the usual manner and enclosed by a suitable detachable cover 31.

Feed mechanism

The feed mechanism by which simultaneous movement of the front carriage and rear cross slide is effected includes a common feed shaft 32 (Fig. 2) extending transversely of the lathe bed parallel to the main driving shaft 22, and means for driving the shaft in one direction at a desired feed rate.

In this instance, the feed shaft 32 is driven from the spindle 21 which, as has been previously mentioned, is driven from the main drive shaft 22. The connection between the spindle and the feed shaft comprises in this instance a jack shaft 33 (Fig. 2) journaled transversely of the bed of the machine upon which is loosely mounted a worm wheel 34 adapted to engage a worm 35 rigidly carried upon the spindle. Driving connection between the worm wheel and the jack shaft is effected by means of a suitable clutch member 36 splined upon the jack shaft for movement axially thereof into and out of engagement with a complementary clutch member 36^a mounted upon the worm wheel. Movement of the clutch member 36 is controlled by means of a shiftable actuator rod 37 extending transversely of the headstock.

One end of the jack shaft 33 carries a gear 38 arranged to mesh with a second gear 39 rigid upon the feed shaft 32. Thus a driving connection between the main drive shaft 22 and the feed shaft 32 through the intermediate spindle 21 is provided which permits of independent operation of the spindle and which prevents operation of the feed shaft when the spindle is idle.

The feed shaft 32 is arranged to drive both the front carriage 13 and the rear cross slide 20. To this end the feed shaft is connected to drive the front carriage by means comprising a pair of change speed pick-off gears 40 and 41 (Figs. 2 and 3). The gears 40 and 41 are omitted in Fig. 1. The pick-off gear 40 is suitably splined upon the forward end of the feed shaft. The other of said pick-off gears is splined upon a stub shaft 42 rotatably mounted in the front side of the bed at an appropriate point substantially in longitudinal alinement with the lower portion of the front carriage. The front carriage carries an elongated bar 43 rigidly secured thereto, as by means of the bolts 44, which bar extends longitudinally along the front side of the bed from either side of the carriage. The disposition of the bar on the carriage is such that one end of the bar (the forward or left in the drawings) extends above and substantially adjacent to the short shaft 42 and is provided with rack teeth 45 upon its lower side arranged to engage a pinion 46 mounted upon and rotatable with the short shaft 42. Thus rotation of the feed shaft will effect a movement of the carriage longitudinally of the bed of the lathe through the pick-off gears 40, 41, the pinion 46 and the rack 45 on the bar 43.

The driving connection between the feed shaft and the rear cross slide comprises a pair of pick-off gears 47, 48 (Figs. 2 and 3) one of which is mounted upon the other or rear end of the feed shaft 32. The other of the pick-off gears is suitably mounted upon a short shaft 49 (Fig. 3) journaled in the rear side of the bed and the pick-off gears are enclosed by a suitable detachable cover 50.

The short shaft 49 also carries a pinion gear 51 rigidly thereon which engages rack teeth formed on a bar 52 (Fig. 3) mounted for sliding movement longitudinally of the bed. The other end of the bar 52 (Fig. 4) is slidably supported in a suitable passage-way 53 provided in the rear carriage 18 and rack teeth formed upon the side of the bar mesh with a gear 54 mounted upon a vertical shaft 55 journaled in the lower portion of the rear carriage.

A spiral cam slot 56, having any desired slope, is provided in the upper face of the pinion gear 54 and is arranged to be engaged by a cam roller 57 carried upon the depending end of the cam follower 58 vertically mounted in the lower portion of the rear cross slide 20. Thus rotation of the feed shaft 32 effects a feed movement of the rear cross slide through the pick-off gears 47, 48, the pinion, rack, and gear connection 51, 52 and 54 and the cam connection between the gear 54 and the rear cross slide 20.

In order to adjust the rear cross slide relative to the rear carriage and independently of the driving means, a generally well-known adjusting screw device 59 is provided between the upper or tool supporting portion of the cross slide and the lower or power actuated portion, and a suitable clamping device 60 is employed to maintain the upper and lower portions of the cross slide in the desired position attained by means of the adjusting device.

By providing separate sets of pick-off gears 40, 41 and 47, 48 in the driving connections between the feed shaft on the one hand and each of the tool supports on the other, it becomes possible to vary the speed of movement and consequently the length of stroke of one support independently of the other. Thus it is possible to employ the simple single feed shaft construction without impairing the adjustability of the machine in accommodating it to different tooling operations.

The driving connection which has just been described is effective only to move the tool supports in one direction, i. e. through a feeding movement during which the cutting operation occurs. The traverse or non-cutting movements of the front carriage and the rear cross slide are preferably performed manually since, in the smaller sizes of lathes, such a manual operation may be more rapidly and efficiently accomplished and requires but little effort on the part of the operator.

The manual control in the present embodiment comprises a hand wheel 61 (Fig. 1) rigidly mounted upon a shaft 62 suitably journaled in the bed of the lathe. Herein the shaft 62 is positioned near the tail end of the lathe adjacent and underlying the bar 43 carried by the front carriage. Rack teeth 63 are provided upon the lower face of the bar to engage a suitable pinion 64 rigidly carried by the hand wheel shaft 62. In this manner rotation of the hand wheel 61 effects a movement of the front carriage toward or away from a piece of work mounted in the lathe.

Simultaneously, movement of the front carriage by the hand wheel effects a rotation of the feed shaft through the driving connection therewith to move the rear cross slide toward or away from the piece of work through its connection with the feed shaft. It is desirable that this arangement of parts be employed in order to simplify the operation of the lathe, since it permits an operator standing centrally of the lathe to move the hand wheel in the desired direction of carriage travel by grasping the upper part of the hand wheel, which part is the most convenient to his hand.

Control

The automatic control mechanism in the present embodiment contemplates the provision of a means which automatically operates the feed clutch to initiate the feeding movement of the tool supports at a predetermined point in the manually actuated approach movement of the tool supports to the work piece. The control mechanism also operates to disengage the feed clutch to stop the feeding movement of the tool supports after the cut has been completed.

The operation of the spindle is also preferably controlled by the traverse movements of the tool supports, the control being operable to engage the main clutch to start the spindle during the approach of the tool supports and to stop the spindle during the return thereof.

Referring to Figs. 2 and 5, the shiftable actuator 30 which controls the main clutch 29 is provided with a means for manually controlling the engagement of the clutch. To this end an arm or hand lever 65 is mounted upon the upper end of a vertical shaft 66 supported in a suitable bracket 67 upon the head stock of the lathe. The arm 65 carries an upstanding pin having a squared end 68 (Fig. 5^a) which engages a slot formed in the side of the shiftable actuator 30 near the forward end thereof, and has a handle 69 mounted thereon. Swinging movement of the hand lever in one direction or the other causes a transverse movement of the shiftable actuator 30 in the headstock to effect an engagement or disengagement of the main clutch to start and stop the machine.

A manual control is also provided for the feed clutch 36 (Fig. 2) and in this instance comprises a vertically disposed shaft 70 also journaled in the bracket 67. which shaft carries at the lower end thereof a mutilated disk 71 (Figs. 5 and 6) having gear teeth 72 formed upon a segmental portion of the periphery thereof to engage rack teeth 73 formed upon the end of the shiftable actuator 37 for the feed clutch. An operating handle 74 rigid with the upper end of the shaft 70 permits rocking motion to be imparted to the shaft, thereby effecting a transverse movement of the shiftable actuator 37 in the headstock to engage and disengage the feed clutch and control the drive of the feed shaft from the spindle.

Means arranged for movement with the front carriage is provided automatically to operate both the main clutch 29 and the feed clutch 36 which means is adjustable to permit the clutches to be operated at any desired predetermined point in the movement of the front carriage. To this end a block 75 (Figs. 1, 5 and 6) is mounted for slidable adjustment on the upper portion of the carriage in any suitable manner as by means of the bolts 76 on the block arranged to engage a longitudinally extending T-slot 77 in the carriage.

A control bar 78 is connected for movement with the block as by means of the pin 79 screw-threaded into both the block and the control bar to provide further means for adjustment. Preferably the free end of the control bar is supported in a bracket 78^a on the bed 10 for sliding movement relative thereto and the disposition and arrangement of parts is such that the control bar extends adjacent one side and beneath the lower ends of the vertically disposed clutch control shafts 66 and 70 of the control mechanisms for the main and feed clutches.

Means carried by the control bar is arranged to rock the control shafts in one direction or the other as the control bar moves through certain positions. Thus the vertical control shaft 66 for the main clutch carries a mutilated disk 80 (Figs. 5 and 6) rigidly mounted on its lower end. A portion of the disk extends laterally of the shaft to a position overlying the control bar 78 and this portion of the disk carries a pair of pins 81, 82 depending toward the surface of the control bar. If desired, anti-friction rollers 83 may be carried by the pins. The control bar carries upon the upper surface thereof a pair of trip members in the form of spaced star wheels 84 and 85 journaled on adjustable brackets 86 for rotation in a horizontal plane and positioned so that the points of the wheels may engage the depending pins on the disk. The wheels are substantially similar and are held against rotation in one direction by similar ratchet means which preferably comprises pawls 87 pressed into engagement with the back side of the points on the wheels by springs 88.

As may be seen in Fig. 6, the star wheels and pawls are disposed so that the wheels rotate in opposite directions. Thus the star wheel 84 on the forward (left hand) end of the control bar is mounted for counter-clock-wise rotation and the rear (right hand) star wheel 85 is mounted for clock-wise rotation. Preferably, the position of the forward star wheel 84 is such that in the remote position of the front carriage from the work the projections on the wheel are forwardly of the pin 82 on the disk 80. Thus during the rapid approach of the carriage one of the points on the forward star wheel 84 engages the pin 81 on the disk 80 to rock the vertical shaft 66 and engage the main clutch.

Preferably, the automatic means which controls the feeding movement of the tool supports, is associated with the spindle control mechanism in such a manner that the feed clutch will be engaged just after the spindle has started to rotate. In this embodiment, the actuating disk 71 on the lower end of the vertical feed clutch control shaft 70 is slotted to provide a semi-circular recess therein having a substantially diametrically extending side wall 89 (Fig. 6).

An arm 90, pivotally mounted at one side of the recess, so that one side of the arm may abut the side 89, projects beyond the periphery of the disk 71 into engagement with an abutment 91 in the form of a shoulder positioned upon the main clutch control disk 80. Suitable means such as the helical spring 92 seated in a bore 93 in the disk 71 and bearing against the arm 90 tends to maintain the projecting end of the arm in engagement with one side of the abutment. A pin 94 is mounted on the disk 71 to limit the swinging movement of the arm away from the side of the recess.

In operation, as the main clutch control disk 80 is engaged and rotated by the star wheel 84 on the control bar, the engagement between the abutment 91 and the arm 90 moves the arm against the side of the recess 89 and swings the feed clutch control disk 71 to move the feed clutch into operative engagement. The lost motion connection attained by the pivoted arm is sufficient to insure that the feed clutch will not be thrown into engagement until after the main clutch has been engaged to start the spindle.

The means by which the feed clutch is disengaged from its driving connection with the front carriage at the completion of the cut comprises a stop member 95 projecting from the control bar, which stop is arranged to engage a semi-circular lug 96 (Fig. 5) depending from the feed clutch control disk 71. The clutch engaging movement of the feed control disk 71 has moved the arm 90 to such a position that the end of the arm is free to swing past the abutment on the main clutch control disk so that upon engagement of the feed stop 95 with the lug 96, the disk is swung in a return direction to disengage the feed clutch without affecting the spindle control mechanism. In this manner the tool supports may be automatically disengaged from the feed drive at the completion of the work cut to permit the supports to be returned to their remote position by the manual control mechanism.

It will be seen during the feeding that movement of the tool supports the forward star wheel 84, which initiates the rotation of the spindle, has moved out of engagement with the depending pin 81 and the rear star wheel 85 has engaged the second depending pin 82 and has been rotated one notch to permit the star wheel to pass the pin. The return movement of the tool supports under the manual control therefore moves the rear star wheel 85 into engagement with the depending pin 82 to effect a reverse rocking movement of the main clutch control disk 80 to disengage the main clutch and stop the spindle. As the carriage approaches its remote position the outstanding projection on the forward star wheel 84 engages the depending lug 81 and rotates the wheel one notch to permit the wheel to pass the pin and return to its initial position.

Operation

In considering the operation of the machine, it is assumed that the rear carriage and the front cross slide have been secured by means of the clamping devices 18^a and 16 in predetermined positions upon the bed of the lathe and the front carriage respectively, and that a piece of work has been mounted between the head stock and the tail stock. The front carriage and the rear cross slide will then be at their remote positions from the work piece i. e. with the carriage withdrawn to the right of the piece and the rear cross slide withdrawn rearwardly. By moving the upper part of the hand wheel 61 toward the piece of work the front carriage is advanced toward the work. Simultaneously the feed mechanism is rotated through the driving connection of the front carriage therewith to effect a similar approach of the rear cross slide. At a predetermined point prior to the engagement of any of the tools with the work piece, the star wheel 84 on the control bar 78 strikes the pin 81 thereby actuating the main clutch control and engaging the clutch 29.

Further movement of the main clutch disk 80 swings the feed clutch control disk 71 through the lost motion connection therebetween to engage the feed clutch and drive the jack shaft 33. Further movement of the carriage 13 by the manual operating means is at once prevented by this engagement and the tools are fed at a low speed into engagement with the work.

At the completion of the cut the stop 95 (Fig. 5) on the control bar strikes the depending lug 96 on the feed clutch control disk 71 and swings the disk to disengage the feed clutch. The tool supports may then be returned to their remote positions by the manual control and in doing so the engagement of the star wheel 85 with the depending pin 82 swings the disk 80 to disengage the main clutch and stop the spindle. After the tool supports have been returned to their initial positions, the finished work piece may be removed from the lathe and a new piece inserted.

It will be apparent from the foregoing that the invention provides a machine which is completely automatic except for the rapid approach movement of the tools toward the work and for the return movement of the tools to their initial positions after the cut has been completed. By providing a control means which is operable to supplant the manually actuated approach of the tools at a predetermined point prior to the engagement of the tools with the work, the possibility of moving the tools into engagement with the work so rapidly as to break the tools is eliminated. In addition the control means stops the feeding movement of the carriage at the end of the cut thereby permitting operation of the manual actuating means to return the carriage and the rear cross slide 28 to their remote positions. The unitary feed mechanism driven from the spindle and drivingly connected to both the front carriage and the rear cross slide permits of a simplified construction and control and this together with the simple and effective control mechanism provides a control for the lathe which is simple and rugged in construction and effective in operation.

It will also be seen that with the combined manual and automatic control features for moving the front carriage and the rear cross slide through their cycle of operations considerable time is saved due to the rapidity and simplified manner in which the automatic control and the manual control supplant each other.

I claim as my invention:

1. In a machine tool, the combination of a prime mover, a spindle driven thereby, a feed shaft, means for driving said feed shaft from said spindle including a feed clutch, a plurality of tool supports connected to said feed shaft for movement thereby, manually operable means for moving said tool supports when said feed clutch is disengaged, and means for engaging said feed clutch by movement of said tool supports by said manually operable means through a predetermined position.

2. In a machine tool, the combination of a prime mover, a spindle, a main clutch connecting said prime mover to said spindle, a feed shaft, means for driving said feed shaft from said spindle including a feed clutch, a plurality of tool supports connected to said feed shaft for movement thereby, manually operable means for moving said tool supports when said feed clutch is disengaged, and control means operable by the movement of one of said tool supports in the working direction to engage the main clutch and subsequently to engage said feed clutch.

3. In a machine tool, the combination of a prime mover, a spindle, means for driving said spindle from said prime mover including a main clutch, a feed shaft, means for driving said feed shaft from said prime mover including a feed clutch, a plurality of tool supports connected to said feed shaft for movement thereby, manually operable means for moving said tool supports when said feed clutch is disengaged, and control means actuated at predetermined points by the movement of said tool supports by said manual means to engage the main clutch and the feed clutch at spaced intervals and to disengage said feed clutch after further predetermined movement of said tool supports in the same direction.

4. In a machine tool, the combination of a prime mover, a spindle, means for driving said spindle from said prime mover including a main clutch, a feed shaft, means for driving said feed shaft including a feed clutch, a plurality of work supports connected to said feed shaft for movement thereby, means manually operable to move said tool supports when said feed clutch is disengaged, and control means connected to one of said tool supports operable as the tool support passes a predetermined point under the influence of said manually operable means in one direction to engage the main clutch to drive said spindle, said means being further operable at a predetermined point in the return movement of said manually operable means to disengage said main clutch to stop said spindle.

5. In a machine tool, the combination of a prime mover, a spindle, means for driving said spindle from said prime mover including a main clutch, a feed shaft, means for actuating said feed shaft from said spindle including a feed clutch, a plurality of tool supports, means drivingly connecting said tool supports to said feed shaft, manually operable means for moving said tool supports when said feed clutch is disengaged, and automatically operating control means actuated by the movement in one direction of one of said tool supports at predetermined points to effect successive engagements of said main clutch and said feed clutch, and to disengage said feed clutch after a further predetermined movement of said tool support, said control means being further operable upon movement of said tool support in the opposite direction to disengage said main clutch.

6. A machine tool having, in combination, a bed, a tool support movable longitudinally thereof, a rotatably mounted spindle for the work, driving means for the spindle including a main clutch, driving means for moving the tool support at a feed rate in one direction, means for disengaging the driving means from the tool support, manually operable means for moving said tool support when the tool support is disengaged from the driving means, and control means operable by the movement of said tool support to effect an engagement and a subsequent disengagement of the driving means from said tool support.

7. A machine tool having, in combination, a bed, a plurality of tool supports movably mounted thereon, driving means for the tool supports including a feed shaft and a feed clutch, means for driving said feed shaft at a feed rate, manually operable means for moving said tool supports simultaneously when said feed clutch is disengaged, and a control means operable at a predetermined point by the approach of said one of the tool supports to the work to engage said feed clutch.

8. A machine tool having, in combination, a bed, a carriage movable longitudinally thereof, a rotatably mounted spindle for the work, driving means for the spindle including a main drive clutch, driving means for moving the carriage in one direction at a feed rate including a feed clutch, manually operable means for moving said carriage when said feed clutch is disengaged, and control means operable during the manual movement of said carriage to engage said main clutch to drive said spindle and subsequently to engage said feed clutch to supplant the manual movement of said carriage with the power driven feed movement thereof, said control means being further operable after a feeding movement of said carriage through a predetermined distance to disengage said feed clutch.

9. A machine tool having, in combination, a bed, a carriage movable longitudinally

thereof, a rotatably mounted spindle for the work, driving means for the spindle, means including a feed clutch for driving the carriage at a feed rate, manually operable means for moving said carriage when said feed clutch is disengaged, and a control means operable at a predetermined point in the manually effected approach of said carriage to the work to engage said feed clutch.

10. In a lathe, having in combination, a bed, a carriage moving longitudinally thereof, a cross slide movable transversely thereof, a common feed shaft for driving the carriage and cross slide, means for driving said feed shaft at a feed rate, and two means drivingly connecting said carriage to said feed shaft and said cross slide to said feed shaft, each of said two means including a change speed mechanism to permit adjustment of one independently of the other and one of said means being operable to transmit power and movement from said carriage to said feed shaft.

11. A lathe having, in combination, a bed, a carriage movable longitudinally thereof, a cross slide movable transversely thereof, a driven feed shaft for moving said carriage and said cross slide at a feed rate and two separate means each including pick-off gears for operatively connecting said feed shaft with the carriage and with the cross slide, said means being operable to transmit power and movement from said shaft to said carriage and cross slide or vice versa.

12. A lathe having, in combination, a bed, a carriage movable longitudinally of said bed, manually operable means for moving said carriage comprising a rack carried by said carriage and a manually rotatable pinion mounted on the bed and engaged in said rack, and power driven means for feeding said carriage including a feed shaft and means including a pair of pick-off gears connecting said feed shaft and rack.

13. A lathe having, in combination, a bed, a carriage movable longitudinally of said bed, clutch controlled driving means providing a feeding movement of said carriage in one direction, manually operable means for moving said carriage when said driving means is disengaged therefrom, said manually operable means comprising a bar mounted on said carriage and extending from one end of the carriage longitudinally of the bed, a shaft journaled in said bed adjacent one side of said bar, means for manually rotating said shaft, and a rack and pinion between said shaft and said bar.

14. A lathe having, in combination, a bed, a carriage movable longitudinally thereof, a bar rigidly secured to said carriage and extending longitudinally of the bed from either side of said carriage, means for driving said carriage including a rack carried by one end of said bar and a driven pinion operatively engaging said rack, and means for manually moving said carriage including a rack on the opposite end of said bar and a pinion engaging said rack rotatably mounted on said bed.

15. A lathe having, in combination, a bed, a carriage movable longitudinally thereof, a bar rigidly mounted on said carriage and extending longitudinally of the bed from either side of said carriage, power driving means for said carriage including a rack and pinion engaging one end of said bar, and manually operable means for moving said carriage including a rack and pinion engaging the other end of said bar.

16. A lathe having, in combination, a bed, a tool support movable longitudinally thereof, a bar carried by said tool support extending longitudinally of the bed from each side of the tool support, driving means engaging one end of said bar to move said tool support at a feed rate, and means engaging the other end of said bar manually operable to actuate said tool support through the traverse movement thereof.

17. A lathe having, in combination, a bed, a tool support movable longitudinally thereof toward and from a piece of work, a member carried by said tool support and extending longitudinally of the bed, means for moving said tool support at a feed rate, and manually operable means engaging said member to actuate said tool support through the traverse movement thereof, said manually operable means having a grip portion movable in the same direction as the tool support.

18. A lathe having, in combination, a bed, a tool support movable longitudinally thereon toward and away from a piece of work, and manually operable means including a hand wheel rotatably mounted on the bed at the tailstock end thereof, and means connecting said wheel to said tool support for effecting such movement operable to move said tool support in the direction of movement of the upper portion of the hand wheel.

19. In a lathe, in combination with a rotatable spindle and a movable carriage, a pair of clutches for controlling the operation of said spindle and carriage, and automatic means for engaging and disengaging said clutches comprising clutch actuating elements connected to each clutch, a trip device movable with said carriage arranged to engage and actuate one of said clutch elements as said carriage moves in one direction, a second trip device also movable with said carriage arranged to engage and reverse the action of said clutch element as the carriage moves in the other direction, and a third trip device operable upon the other of said clutch actuating elements.

20. In a lathe, in combination with a spindle and a movable carriage, a pair of clutches

controlling the operation of said spindle and carriage, and means operable automatically to engage and disengage said clutches, comprising clutch actuating elements connected to each of said clutches, a member movable with said carriage, a pair of trip devices mounted in spaced relation on said member arranged to move into operating engagement with one of said clutch actuating elements as said carriage is moved in one direction or the other to engage or disengage said clutch, and means connecting said trip actuated element to the other of said elements for movement therewith as said trip actuated element is moved in the clutch engaging direction.

21. In a lathe, in combination with a spinand a movable carriage, a spindle clutch and a carriage feed clutch for controlling the respective operative movements thereof, and means for automatically effecting the engagement and disengagement of said clutches comprising a clutch actuating element connected to each of said clutches, a trip device movable with said carriage to engage and actuate said spindle clutch element in a clutch engaging direction, means connecting said spindle and carriage clutch elements to effect a corresponding movement of said carriage clutch element as said spindle clutch element is moved in the clutch engaging direction, means movable with said carriage for disengaging said carriage clutch element independently of the other element, and a second trip device also movable with said carriage for moving said spindle clutch element in the disengaging direction.

22. A lathe having, in combination with a spindle and a movable carriage, a spindle clutch and a carriage feed clutch for controlling the respective operative movements of said spindle and carriage, and means for automatically controlling said clutches, said means comprising a spindle clutch actuator and a carriage clutch actuator operatively connected to each of said clutches respectively, means connecting said carriage clutch actuator to said spindle clutch actuator to effect a movement of said carriage clutch actuator in a clutch engaging direction as said spindle clutch actuator is moved in a clutch engaging direction, a trip device movable with said carriage into engagement with said spindle clutch actuator to move said actuator in a clutch engaging direction, a second trip device also movable with said carriage into engagement with said carriage clutch actuator to move said actuator in a clutch disengaging direction, and a third trip device also movable with said carriage into engagement with said spindle clutch actuator to move said actuator in a disengaging direction.

23. In a lathe, in combination with a rotatable spindle and a movable carriage, a pair of clutches for controlling the operation of said spindle and carriage, and automatic means for engaging and disengaging said clutches comprising clutch atcuating elements connected to each clutch, a trip device movable with said carriage arranged operably to engage one of said actuating elements only as said carriage moves in one direction to effect an engagement of the corresponding clutch, a second trip device also movable with the carriage and positioned in spaced relation to said first mentioned trip device and arranged to engage the same actuating element to disengage the clutch only as the carriage moves in a reverse direction, and means for actuating the other clutch element.

24. In a lathe, in combination with a rotatable spindle and a movable carriage, a pair of clutches for controlling the operation of said spindle and carriage, and automatic means for engaging and disengaging said clutches comprising clutch actuating elements connected to each clutch, a member movable in accordance with said carriage and extending to a position adjacent said actuating elements, a pair of ratchet devices mounted for rotation in opposite directions on said member, one of said devices being operable as said carriage moves in one direction to engage and move said spindle clutch element in a clutch engaging direction and the other of said ratchet devices being capable of reversing the movement of said element to disengage the spindle clutch as the carriage moves in the other direction, a lost motion connection interposed between said spindle clutch element and said carriage clutch element operable as the spindle clutch element is moved in the clutch engaging direction to effect a subsequent movement of said carriage clutch element also in a clutch engaging direction, and means carried by said member and movable therewith into engagement with said carriage clutch element to move said element in a clutch disengaging direction.

25. In a machine tool, the combination of a prime mover, a spindle and a carriage, one of which supports the work and the other the tool, a clutch between the prime mover and the spindle, a driving connection between the spindle and the carriage, a clutch in said connection, and mechanism operable by the carriage for operating said clutches.

26. In a machine tool, the combination of a prime mover, a spindle and a carriage, one of which supports the work and the other the tool, a clutch between the prime mover and the spindle, a driving connection between the spindle and the carriage, a clutch in said connection, manual means for moving the carriage, and mechanism operable by the carriage when moved in the working direction by said manual means for throwing in the first clutch and the second clutch in the order stated.

27. In a machine tool, the combination of

a spindle and a carriage, one of which supports the work and the other the tool, a clutch controlling the supply of power to the spindle, a clutch controlling the supply of power to the carriage, manual means for moving one of said parts (namely, the spindle and the carriage), and mechanism operable by said manually operable part when moved in the working direction by said manual means for throwing in the first clutch and the second clutch in the order stated.

28. In a machine tool, the combination of a spindle and a carriage, one of which supports the work and the other the tool, means controlling the supply of power to the spindle, means controlling the supply of power to the carriage, manual means for moving one of said parts (namely, the spindle and the carriage), and mechanism operable by said manually operable part when moved in the working direction by said manual means for throwing in the first controlling means and the second controlling means in the order stated.

29. In a machine tool, the combination of a spindle and a carriage, one of which supports the work and the other the tool, a clutch controlling the supply of power to the spindle, a clutch controlling the supply of power to the carriage, a hand wheel and connections for moving one of said parts (namely, the spindle and the carriage) in opposite directions, and mechanism operable by said manually operable part for engaging and disengaging both of said clutches.

30. In a machine tool, the combination of a prime mover, two movable parts, one of which supports the work and the other the tool, a clutch between the prime mover and one of said parts, a driving connection between said parts, a clutch in said connection, manual means for moving the other of said parts, and mechanism operable by said other part when moved in a certain direction by said manual means for throwing in the first clutch and the second clutch in the order stated.

31. In a machine tool, the combination of a spindle and a carriage, one of which supports the work and the other the tool, a clutch controlling the operation of the spindle, a clutch controlling the supply of power to the carriage, manual means for moving the carriage, and mechanism operable by the carriage when moved in the working direction by said manual means for throwing in the first clutch and the second clutch in the order stated.

32. In a lathe, the combination of a prime mover, a work-supporting spindle, a tool carriage, a clutch between the prime mover and the spindle, a driving connection between the spindle and the carriage, a clutch in said connection, manual means for moving the carriage in opposite directions, and mechanism operable by the carriage when moved in the working direction by said manual means for throwing in the first clutch and the second clutch in the order stated, said mechanism being operable by the carriage when continuing to move in said direction to throw out the second clutch, and being operable by the carriage when moved in the opposite direction to throw out the first clutch.

33. In a machine tool, the combination of a spindle and a carriage, one of which supports the work and the other the tool, a clutch controlling the supply of power to the spindle, a clutch controlling the supply of power to the carriage, manual means for moving the carriage in opposite directions, and mechanism operable by the carriage when moved in the working direction by said manual means for throwing in the first clutch and the second clutch in the order stated, said mechanism being operable by the carriage when continuing to move in said direction to throw out the second clutch, and being operable by the carriage when moved in the opposite direction to throw out the first clutch.

34. In a machine tool, the combination of two movable parts, one of which supports the work and the other the tool, means controlling the supply of power to one of said parts, means controlling the supply of power to the other part, manual means for moving one of said parts in opposite directions, and mechanism operable by the last mentioned part when moved in the working direction by said manual means for throwing in the first controlling means and the second controlling means in the order stated, said mechanism being operable by the last mentioned part when continuing to move in said direction to throw out the second controlling means, and being operable by the last mentioned part when moved in the opposite direction to throw out the first controlling means.

35. In a machine tool, two clutch-controlling members mounted for pivotal movement on parallel axes, two pins on one of said members, a reciprocatory part, two ratchet members on said part, one of which is adapted to engage one of said pins to throw in the corresponding clutch upon movement of said part in one direction, the other ratchet member being arranged to engage the other pin to throw out the corresponding clutch upon movement of said part in the other direction, a lost-motion connection between said clutch-controlling members whereby the member that carries said pins is arranged to move the other clutch-controlling member to throw in the corresponding clutch, and a stop member on said reciprocatory part arranged to engage and move said other clutch-controlling member to throw out the corresponding clutch.

36. In a machine tool, a bed, a carriage movable along the bed, manual means for moving the carriage in opposite directions, a

power drive for moving the carriage in a certain direction, and a control for said drive arranged to be actuated by the carriage when manually moved in the last mentioned direction to cause continuing movement of the carriage in that direction under power, and arranged to be actuated by the carriage in such continuing movement to interrupt movement of the carriage under power.

In testimony whereof, I have hereunto affixed my signature.

ERNEST J. SVENSON.